Twigg-Smith Residence

Proposed Single Family Residence at
3868 Round Top Drive
Honolulu, Hawaii 96822
TMK 1-2-5-018:033

April 2002

PREPARED FOR:
Michael and Lei'a Twigg-Smith
3007 Hibiscus Drive
Honolulu, Hawaii 96815

PREPARED BY:
R.M. Towill Corporation
420 Waiakamilo Road, Suite 411
Honolulu, Hawaii 96817-4941

1-19360-OP

DRAFT ENVIRONMENTAL ASSESSMENT

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SUMMARY OF PROPOSED ACTION

Project:	Single-Family Residence, 3868 Round Top Drive
Landowner/Applicant	Michael and Lei`a Twigg-Smith
Accepting Agency	State of Hawaii, Department of Land and Natural Resources
Agent	R.M. Towill Corporation
Location	Tantalus, City & County of Honolulu, Oahu, Hawaii
Tax Map Key	1-2-5-018:033
Proposed Action	Develop a single-family residence
Land Area	38,555 square feet
Present Use	Vacant
State Land Use District	Conservation, Resource Subzone
Development Plan Land Use Designation	Preservation
Present Zoning	P-1 Restricted Preservation
Special Management Area	No
Anticipated Determination	Finding of No Significant Impact (FONSI)

CHAPTER 1
INTRODUCTION

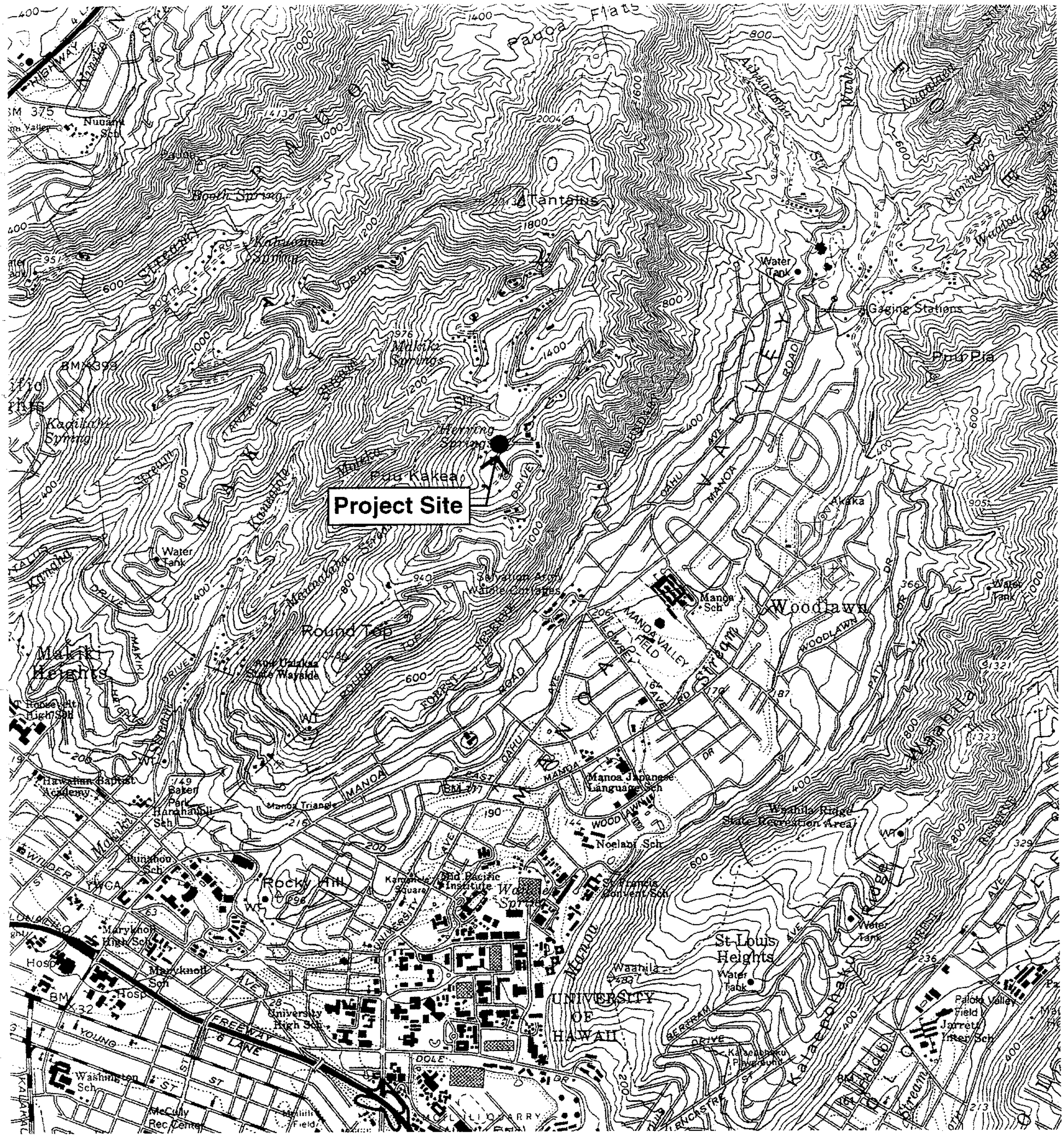
1.1 PROJECT OVERVIEW

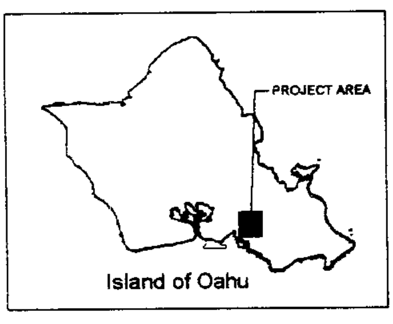
Michael and Lei`a Twigg-Smith propose to develop a single-family residence on their vacant Tantalus property within the State Conservation District. The construction of single family residences is an identified land use in the Resource Subzone of the Conservation District. The home will have three bedrooms and 3 ½ baths in approximately 3,500 square feet of enclosed living area. The design and construction of the residence will conform to standard conditions for single family residences in the Conservation District and applicable State and County regulations. The owners propose to commence construction of the residence in 2003 and finish no later than 2005. The entire project will be privately funded.

The proposed residence is located at 3868 Round Top Drive, Honolulu, Oahu (see FIGURE 1, **Project Location and Vicinity**). The property is also on Puu Kakea Place, a privately owned roadway built to provide access to five residential properties. The 38,555-square foot lot is identified by Tax Map Key 2-5-018:033 (see FIGURE 2, **TMK and Surrounding Properties**). The project is located at the intersection of Puu Kakea Place and Round Top Drive at an elevation of approximately 1,350 feet. The property is not within the Special Management Area (SMA).

1.2 PURPOSE OF THE ENVIRONMENTAL ASSESSMENT

This Draft Environmental Assessment has been prepared pursuant to Hawaii Revised Statutes, Section 343-5-12, which states an environmental assessment shall be required for actions which "propose any use within any land classified as conservation district by the state land use commission under chapter 205." An associated Conservation District Use Application has been submitted to the Department of Land and Natural Resources, pursuant to Hawaii Administrative Rules, Section 13-5-31, "Permit Applications."





Source: USGS, Honolulu Quadrangle

FIGURE 1
LOCATION AND VICINITY MAP
Twigg-Smith Residence, Tantalus, Oahu

0 1000 2000 Feet 4000

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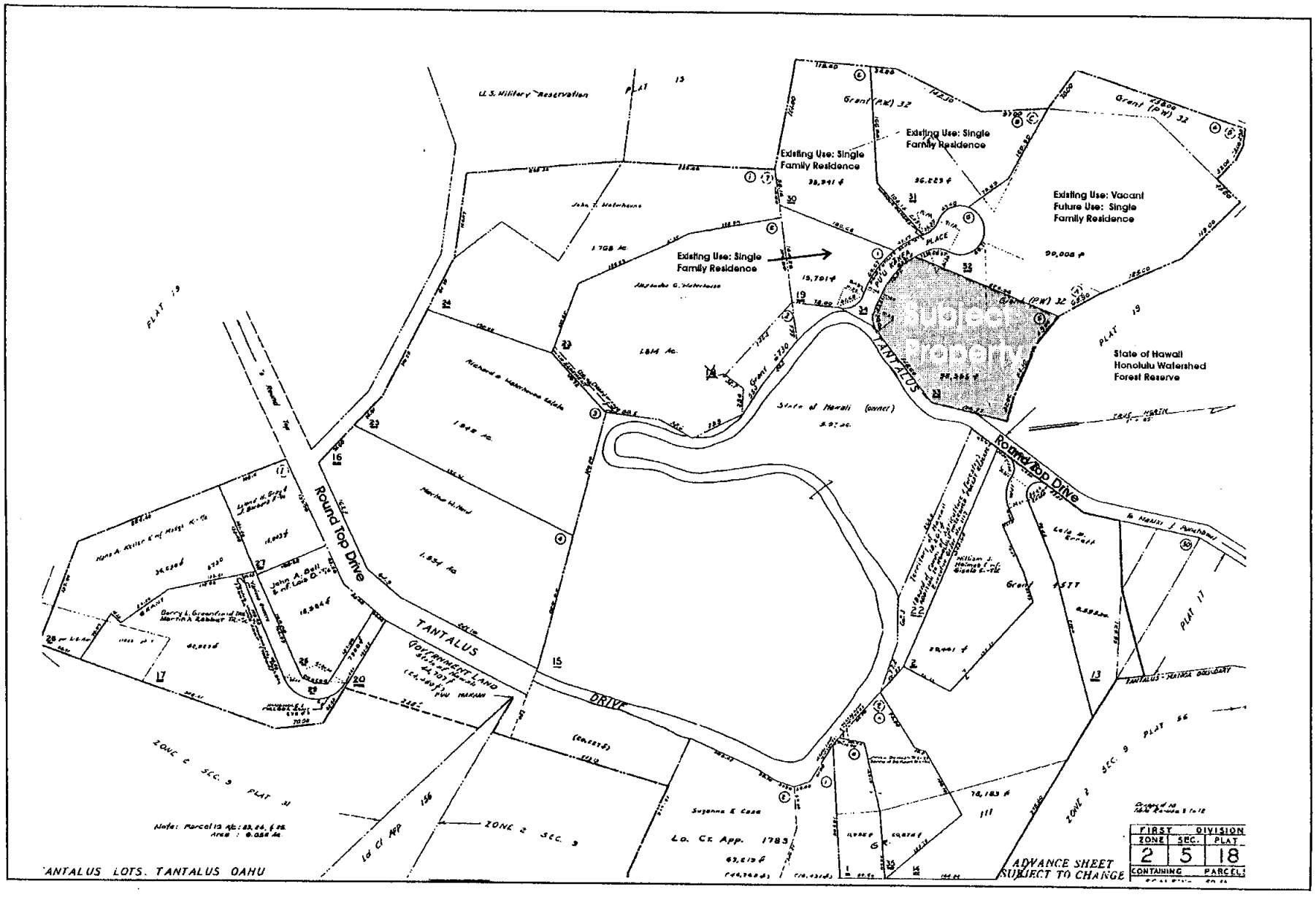
March 2002



Source: Win2Data, First American Real Estate Solutions, L.P., 2001

FIGURE 2
TMK and Surrounding Properties
Twigg-Smith Residence
Tantalus, Oahu

Not to Scale

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1.3 PREVIOUS LAND USE APPROVALS

The property is one of five lots included in a Tantalus subdivision which was approved for single family residential development by the Board of Land and Natural Resources (BLNR) on December 15, 1989 (File No. OA-7/6/89-2289). This permit allowed the owner to consolidate and resubdivide the property into five lots with a privately built and maintained access cul-de-sac, Puu Kakea Place. Prior to the approval of the subdivision, the subject property was one of the five irregular-shaped lots. The three lots to the south of the site, along Puu Kakea Place, are each developed with a single family residence. The remaining fifth lot is undeveloped.

1.4 PURPOSE AND NEED FOR THE PROJECT

The proposed project will be the primary residence for Michael and Lei`a Twigg-Smith and their children.

1.5 ALTERNATIVES TO THE PROPOSED ACTION

Other than the No Action Alternative, there are no alternatives to the proposed action being considered. The proposed residence has been designed to conform to its natural setting with minimal environmental impacts. Changes to the siting, design, or construction method of the single-family residence would, at best, result in impacts similar to those of the proposed action.

1.5.1 NO ACTION ALTERNATIVE

Under the No Action Alternative, the subject property would remain undeveloped and the potential for environmental, social, and economic impacts disclosed in this Assessment would be precluded. Taking no action does not accomplish the stated purpose of the proposed action which is to provide a primary residence for Michael and Lei`a Twigg-Smith and their children.

CHAPTER 2
DESCRIPTION OF THE PROPOSED ACTION

2.1 EXISTING CONDITIONS

The property is presently devoid of structures. There are several mature trees, scattered shrubbery and expanses of grass sloping downward to the north. The subject parcel was formerly the site of a 6,500-square-foot single family residence that was built in 1912 and demolished in 1994 (Personal communication, Adeline Brash, 2001). The Tantalus neighborhood was established over 100 years ago as a residential community within a heavily wooded, scenic area above Honolulu. The project site is situated approximately 1.3 roadway miles north of Puu Ualakaa State Wayside Park. The property is bounded to the south by Puu Kakea Place; to the north by State land in the Honolulu Watershed Forest Reserve; to the east by Round Top Drive; and to the west by an undeveloped residential lot.

Primary access to the property is from Round Top Drive. Owned and maintained by the City and County of Honolulu, Round Top Drive is a two-lane, asphalt concrete road with no shoulder area in the project vicinity. It provides access for the numerous homes located on Tantalus, as well as scenic vistas of urban Honolulu.

Secondary access to the residence will be via the private roadway Puu Kakea Place, which is jointly owned by the five-lots of the existing subdivision. This cul-de-sac is paved in asphalt concrete and is about 20 feet wide. The bulb of the cul-de-sac area is about 72 feet in diameter.

2.2 DESIGN FEATURES OF THE PROPOSED RESIDENCE

Plans for the proposed residence include a 3,496 square foot, 3-bedroom, 3 ½ bath home. The footprint of the residence will be 2,230 feet. The master bedroom area is the only second-story structure of the residence. The garage will be located beneath the main floor of the residence. (See FIGURE 3, **Site Plan**.)

Architectural plans for the residence incorporate several features of classic Hawaii architecture, including hipped roof lines and extensive use of lava and moss rock surfaces. The design incorporates

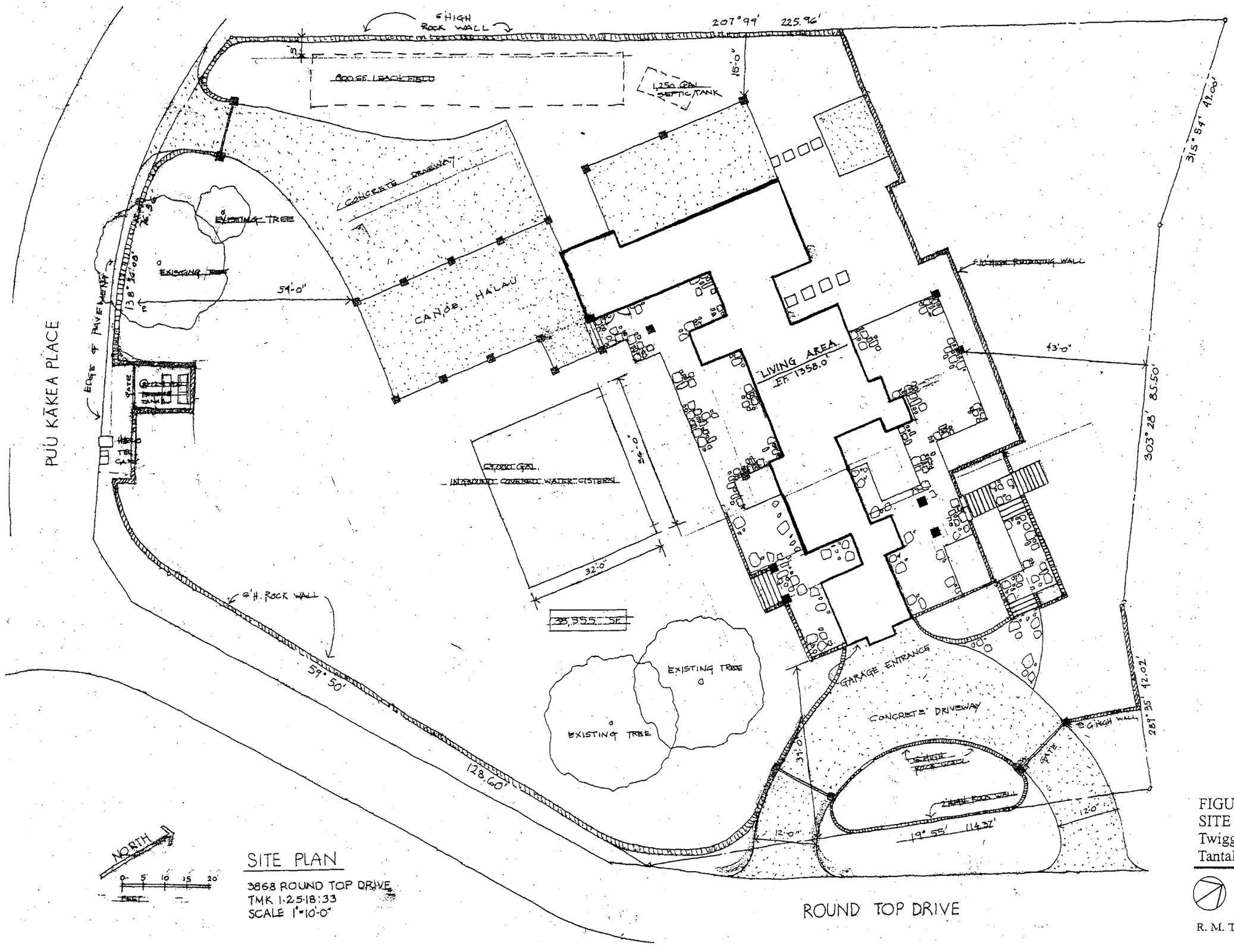

FIGURE 3
SITE PLAN
Twigg-Smith Residence
Tantalus, Oahu

0 10 20 Feet 40

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natural colors for the structure and driveways, use of lava and moss rock walls and facades, and extensive landscaping. Included under the roof is an unenclosed canoe halau designed for covered storage of outrigger canoes. These design features are shown in FIGURE 4, **North and South Elevations** and FIGURE 5, **East and West Elevations**.

The structure will be built on the relatively flat area of the property. Retaining walls will be placed in a east-west direction with grass and landscaping continuing to extend northward on the property's downward slope to the edge of the State-owned forest reserve. The main retaining wall is sited where a pre-existing tile wall was placed on the property. Toward Puu Kakea Place the fill from construction will be used with retaining walls to reduce the slope of the existing grade.

CHAPTER 3
AFFECTED ENVIRONMENT - IMPACTS AND MITIGATION MEASURES

3.1 TOPOGRAPHY

Surface elevations range from about +1,344 feet at the south side of the parcel to +1,364 at the east side, and +1,316 feet on the northern corner of the property. (See FIGURE 6, **Topographic Map**.) From the property's southern boundary, at the corner of Puu Kakea Place and Round Top Drive, the ground surface slopes up approximately 15 feet above the street elevation to a relatively level pad in the middle of the lot where the residence is planned, then slopes steeply down to the northern boundary with the forest reserve. Along the northwest boundary, the ground is level and then slopes up to the adjoining property.

3.1.1 Impacts and Mitigation Measures

The design of the residence retains the property's existing slope to the north toward the Honolulu Watershed Forest Reserve and reduces the southward slope toward Puu Kakea Place. Retaining walls will stabilize slopes to the north of the residence and provide flattening of the lot to the south between the residence and Puu Kakea Place (FIGURE 3, **Site Plan**).

The 10-foot retaining wall fronting the north elevation of the residence (FIGURE 4, **North and South Elevations**) will be constructed as a gravity wall of "keystone" construction. This design has been used successfully in many Mainland installations of private and public facility retaining walls. This type of wall provides for lateral percolation of water because it is not a solid masonry type of wall.

Six-foot retaining walls will be erected near Round Top Drive and Puu Kakea Place along the boundaries of the property. These will be constructed with a black lava rock finish. An additional six-foot curvilinear retaining wall, designed to taper out of the soil, will create one graded step to a flat area to the south of the residence. The reduced slope of this area will be created with fill from on-site excavation.

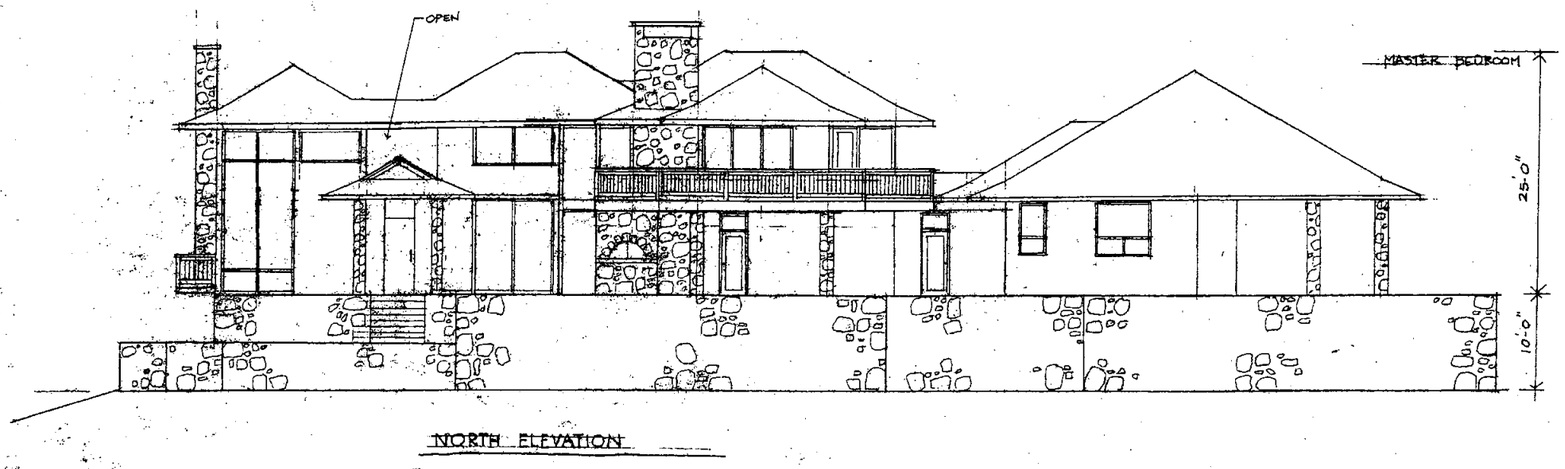
3.2 GEOLOGY

Soils at the property are classified as Tantalus silt loam, which are well-drained soils on uplands that developed from volcanic ash and material weathered from cinders. Permeability is moderately rapid and the erosion hazard is severe (U.S. Department of Agriculture, 1972).

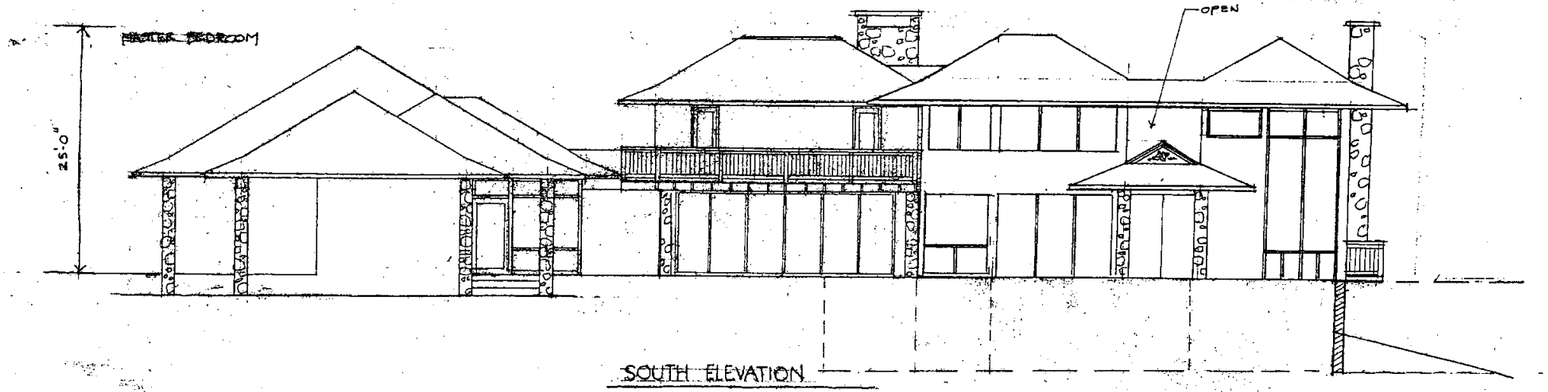
A soils investigation of the property was conducted in 2001 by Shinsato Engineering, Inc. The scope of the study included general subsurface conditions as disclosed by borings; physical characteristics of the soils encountered; recommendations for foundation design, including bearing values, embedment depth and estimated settlement; recommendations for placement of fill and backfill; and special design considerations. The full text of the study is found in APPENDIX A.

3.2.1 Impacts and Mitigation Measures

The project is not expected to significantly impact existing soil conditions at the project site. Based on the 2001 soils study, "the percolation rate of the soil is more than adequate for placement of a leach field associated with a septic wastewater system" (Shinsato Engineering, Inc., 2001). The structural design and siting of the residence as well as the leach field will consider and accommodate the soil conditions (see Section 5.2, **Wastewater**). For discussion of erosion potential and mitigation measures, see Section 3.3, **Drainage**.



NORTH ELEVATION



SOUTH ELEVATION

FIGURE 4
NORTH AND SOUTH ELEVATIONS
Twigg-Smith Residence
Tantalus, Oahu

0 8 16 Feet 32

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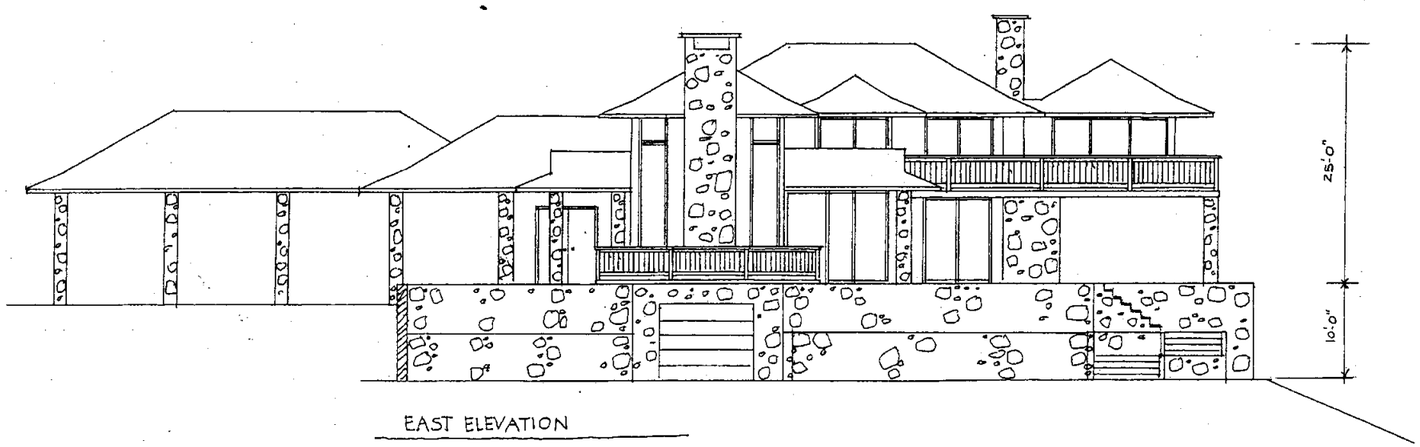
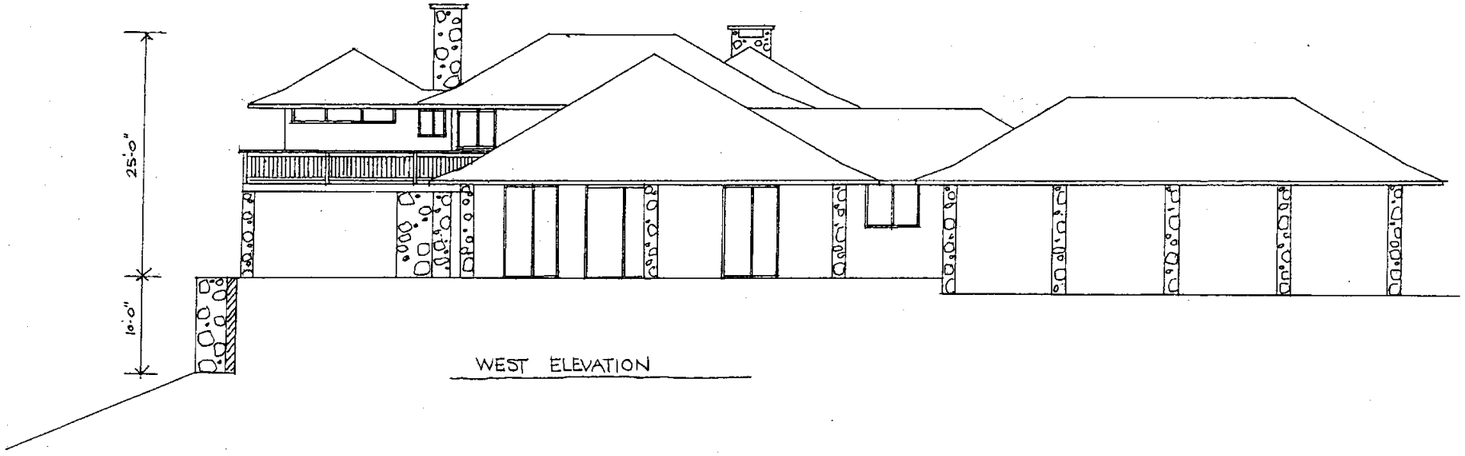


EAST ELEVATION



WEST ELEVATION

FIGURE 5
EAST AND WEST ELEVATIONS
Twigg-Smith Residence
Tantalus, Oahu

0 8 16 Feet 32

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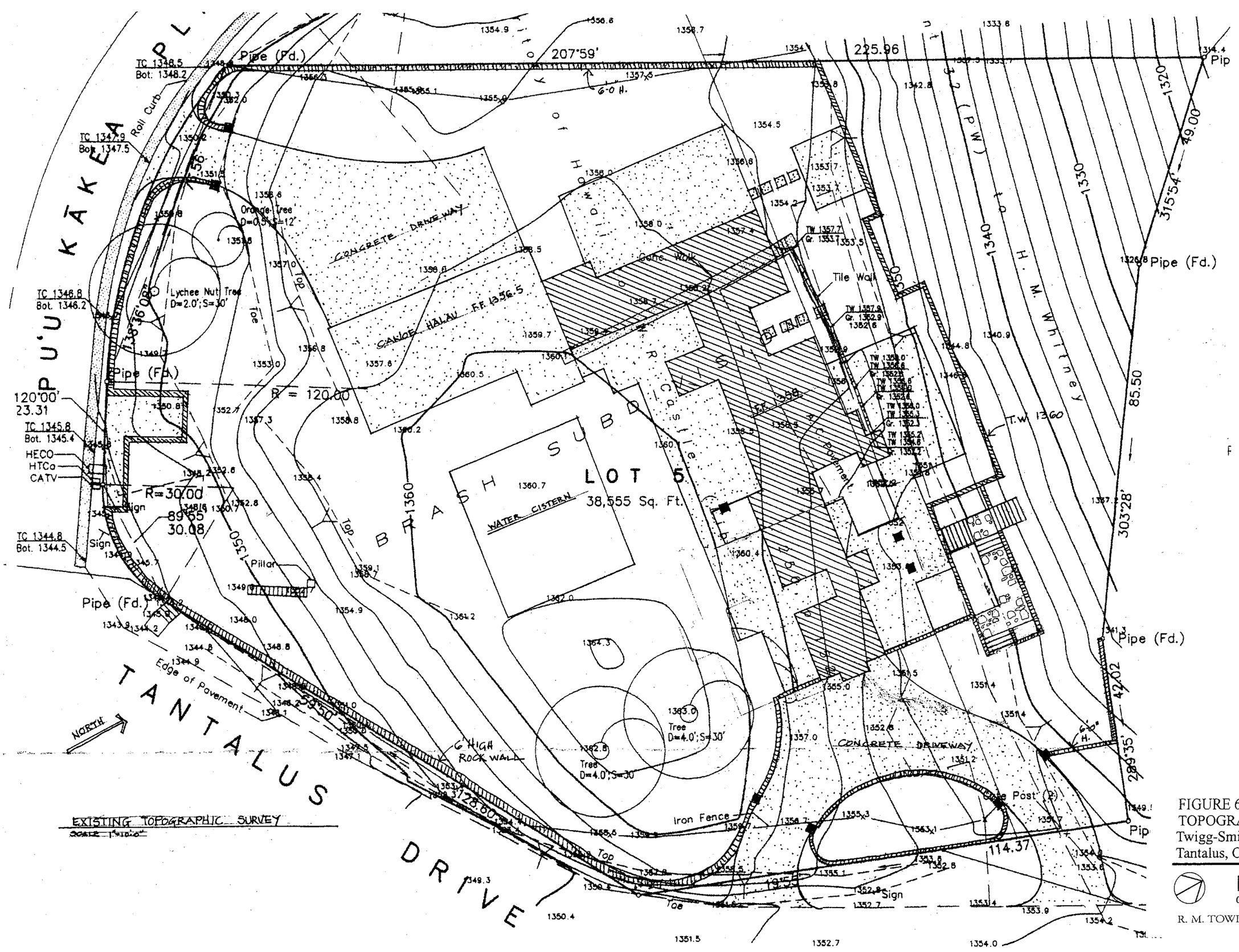

FIGURE 6
TOPOGRAPHIC MAP
Twigg-Smith Residence
Tantalus, Oahu

0 10 20 Feet 40

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3.3 DRAINAGE

Stormwater erosion control is important for this property because of the slope, soil erosion hazard, and abundant rainfall averaging 120 inches per year. There are no streams within the project site. The area under roof, representing 7,371 square feet or 57% of the 12,995-square foot impermeable surface, will be used to divert and capture rainfall for the residence's water supply. Driveways will account for 4,340 square feet or 33% of the impermeable surfaces. Storm water will sheet-flow in two directions: to the north toward the Honolulu Watershed Forest Reserve where a thick Indian bamboo grove borders the site and to the south toward Puu Kakea Place and Round Top Drive.

3.3.1 Impacts and Mitigation Measures

The runoff from the non-permeable surfaces will be directed into the roof rainwater catchment system's 69,000-gallon in-ground cistern or into grassy areas and gravel borders designed to encourage absorption and minimize sheet runoff. Retaining walls will further diminish the potential for significant changes in sheet flow. The retaining walls and distribution of fill from the construction of the proposed structures will create level areas on the lot so rainwater will percolate rather than run off the property.

Areas of the development requiring cut and fill include retaining walls, a septic tank, leach fields, house footings, an in-ground cistern, driveways, terrace areas, removal of vegetation at locations for structures, and structural fill. A total of 546 cubic yards of cut and 516 cubic yards of fill will be required. The excess 30 cubic yards of cut material to be disposed of off-site.

Erosion control methods to be implemented by the contractor before, during and after construction will include, but not be limited to, the following Best Management Practices:

- Perform excavation at the construction site in phases to limit the number of cubic yards of soil being moved at any one time.
- Construct perimeter walls first to retain runoff.
- Locate the construction entrance on Puu Kakea Place so that all construction-related vehicles will enter and leave from this private cul-de-sac.
- Install and maintain a temporary gravel access pad at the entrance to the property from Puu Kakea Place for all construction ingress and egress.
- Regularly inspect gravel pads, especially during periods of heavy rainfall.

- Install silt fences at the boundary of all disturbed areas and areas used for stockpiling and staging.
- Install the geotextile dust barrier fabric and silt fence fabric prior to start of construction and maintain in position until completion of construction activities.
- Install erosion control measures prior to start of the construction phase and maintain until completion of the grading phase.
- Where applicable and feasible, put in place measures to control erosion and other pollutants before any earth moving phase of the grading is initiated.
- Do not remove temporary erosion controls before permanent erosion controls are in-place and established.
- Compact the final lift of each day's work to prevent erosion of fill material.
- Cover and stake burlap and textile fabric on slopes greater than 2:1 (vertical:horizontal)
- Perform all grading work in accordance with Chapter 14, Articles 13, 14, 15, and 16, as related to grading, soil erosion and sediment control, of the Revised Ordinances of Honolulu, as needed.
- Prevent any grading operation that causes rocks, soil, or debris in any form to fall, slide or flow onto adjoining properties, streets or natural watercourses.
- Flag the limits of the grading area before the commencement of grading work.
- Make adequate provisions to prevent drainage flows from damaging the cut face of an excavation or the sloped surfaces of a fill, and prevent sediment-laden runoff from leaving the site.
- Sod or plant all slopes and exposed areas as soon as final grades have been established.
- Plant disturbed areas where work has been interrupted or delayed with temporary or permanent ground cover.
- Inform the City of the location of the disposal site for the project when the application for a grading permit is made. Ensure that the disposal site fulfills the requirements of the grading ordinance.

3.4 AIR QUALITY

Air quality in the project area is excellent. The combination of elevation (+1,300 feet), prevailing trade winds, low volume of vehicular traffic and absence of other pollutant sources contribute to the air quality in the Tantalus area.

3.4.1 Impacts and Mitigation Measures

Air quality impacts attributed to the proposed action will be temporary and include exhaust emissions of construction vehicles and dust generated by short-term, construction-related activities. Grading of the soil and construction of the house and retaining walls will generate airborne particulates. Dust control measures such as regular watering and sprinkling will be implemented as needed to minimize wind-blown emissions.

Construction-related exhaust emissions will be mitigated by ensuring the project contractors maintain their internal combustion engines in proper working order and immediately repair or replace faulty equipment. The contractor, at his own expense, will keep the project area and surrounding area free from dust nuisance. The work will be in conformance with the air pollution control standards contained in Hawaii Administrative Rules, Title 11, Chapters 59, "Ambient Air Quality Standards," and Chapter 60, "Air Pollution Control." Long-term air quality impacts resulting from occupation of the residence and related vehicle traffic are not expected to cause significant increases in air pollution over existing levels. No long-term mitigation is needed.

3.5 WATER QUALITY

No surface water sources exist on the project site. The residence will use a roof water catchment system. Water will be stored in the 69,000-gallon in-ground cistern and will be used to meet all domestic water and fire protection needs. The applicants will provide treatment of the water to ensure acceptable potable quality.

3.5.1 Impacts and Mitigation Measures

Since the property abuts the Honolulu Watershed Forest Reserve, it is important that runoff from construction be controlled (see Section 3.3, DRAINAGE). All grading operations shall be performed in conformance with the applicable provisions of the water pollution control and water quality standards contained in Hawaii Administrative Rules, Chapter 11-55, "Water Pollution Control" and Chapter 11-54, "Water Quality Standards." In consultation with the

Department of Health, Clean Water Branch, no NPDES is needed for construction of the single family residence since the home is not in a stream area and does not involve discharges to State waters (Personal communication, Joanna Seto, March 2002). Further, no Department of the Army permit will be required for this project as waters of the U.S. are not affected.

3.6 NOISE

Existing noise levels at the subject property are very low given the surrounding open space and proximity to adjacent residences. Traffic from Round Top Drive is not a significant source of noise since the roadway does not carry heavy volumes. Furthermore, high vehicular speeds, a major source of vehicular noise, are limited by the severely winding nature of this two-lane roadway.

3.6.1 Impacts and Mitigation Measures

Noise will be generated from short-term construction activity. Construction noise from machines and vehicles may impact nearby existing residences, but will be confined to daylight working hours only. Construction activities will comply with Hawaii Administrative Rules, Chapter 11-46, "Community Noise Control." No grading work shall be done on Saturdays, Sundays and holidays at any time without prior notice to the Chief Engineer, provided that such grading work is also in conformance with HAR, Chapter 11-46. Once construction is completed, it is anticipated that the proposed residence will not have an adverse impact upon existing noise characteristics. Long-term noise impacts resulting from occupation of the residence and related vehicle traffic are not expected to cause significant increases in noise over existing levels. No long-term mitigation is needed.

3.7 BIOLOGICAL RESOURCES

There are no rare, threatened, or endangered plant or animal species or significant habitats on the subject property. Much of the property is covered by introduced grasses. The lot currently contains one 50-75 foot tall eucalyptus and two similarly-sized magnolia trees. Other exotic vegetation on the property includes lychee, orange, banana, umbrella trees, kukui, Indian bamboo, verbena, widelia and heliconia. Common plants such as red ginger, ti leaf, and staghorn fern also are located on the property.

No mammals were observed during site visits to the property, but based on general information about the Tantalus area, it is expected that resident mammals are limited to feral pigs, dogs, cats, and various

rodents. Most of the birds in the area are introduced species such as doves and thrushes. Native birds that may inhabit or traverse the area include the endemic Hawaiian short-eared owl or pueo (*Asio flammeus*) and elepaio (*Chasiempis sandwichensis*). The elepaio is listed on the U.S. Fish and Wildlife Service threatened or endangered species list. The endangered Hawaiian hoary bat (*Lasiurus*) also has been reported in the Tantalus area in recent years. However, no threatened or endangered species are known to be resident.

3.7.1 Impacts and Mitigation Measures

Outdoor lights will be shielded downward and will not be placed higher than 25 feet in order to prevent any impacts to nocturnal avifauna. No other adverse impacts to terrestrial flora and fauna are anticipated from the construction of the single family residence and no further mitigative measures are necessary.

3.8 HISTORICAL, ARCHAEOLOGICAL AND CULTURAL RESOURCES

According to a January 2002 review of the project by the State Historic Preservation Division (SHPD), there are no historic properties on the subject site (APPENDIX B). The SHPD notes that the property is part of the five-lot Brash Subdivision that was approved by the Board of Land and Natural Resources (BLNR) in 1989. In its review of the subdivision application, State Parks commented that there are no known archaeological sites on the subject property, and that given the location of the property, historic sites are not expected to be present. Furthermore, historic and archaeological resources are not likely to be present since the subject property was previously disturbed by development and extended use of a 6,500-square foot single family residence built in 1912.

The project site and surrounding vicinity are not known for traditional cultural practices. The residence will not block existing view planes, is not visible from coastal waters, and will not obstruct any natural features or landmarks. Interviews with area residents did not reveal any information regarding traditional and modern-day practices specific to the project area (i.e. gathering for hula, medicinal or other cultural practices). The property does not block access to forest resources. There are not likely to be burial sites on the subject property due to previous disturbance of the land, the nature of the soil, and the project location away from the shoreline and natural cave areas. The interviews also did not yield any new information about the presence of archaeological sites, trails, or possible burial features.

3.8.1 Impacts and Mitigation Measures

No impacts to cultural resources or practices are expected to result from the proposed project activities. In the unlikely event that archaeological remnants are unearthed, work will be halted and the State Historic Preservation Division notified to assess impacts and implement mitigative measures deemed necessary.

3.9 SCENIC RESOURCES

The subject property is visible in the foreground of south-looking views from Forest Ridge Way and Kalaiopua Loop (FIGURE 7, **View Planes**). From those vantage points, the property currently appears as a grassy area between the bamboo forest in the foreground and the ridge line in the background (FIGURE 8,**View Towards Property from Kalaiopua Loop**). The property does not affect views of Diamond Head from Forest Ridge Way and Kalaiopua Loop. The lot is not visible from shoreline areas to the south. From Round Top Drive northbound the property is visible along Puu Kakea Place. Along Round Top Drive there is a steep, approximately 15-foot grass-covered rise from the roadway. The first southbound view of the property on Round Top Drive is a chain-link gate at the level of the roadway followed by continuation of the 15-foot rise at the south of the property.

3.9.1 Impacts and Mitigation Measures

Lot Coverage and Visibility. The residence plus impermeable surfaces such as driveways will result in approximately 34% lot coverage. The north elevation of the proposed residence will be visible from Forest Ridge Way and Kalaiopua Loop (FIGURE 9, **Telephoto View of Proposed Residence from Kalaiopua Loop**). The planned 10-foot east/west retaining wall will be in approximately the same position as a former 5-foot retaining wall installed between elevations of 1,352 and 1,357 feet. Views of the grassy area descending into the bamboo forest on the northern area of the property will not be disrupted. The rise in topography from Round Top Drive will not be disrupted. The rise in topography visible from Round Top Drive will be partially screened by a 6-foot lava and moss rock retaining wall around the perimeter of the property. The view northbound on Round Top Drive will be across Puu Kakea Place. The upper 10 feet of the house will be visible. From Round Top Drive southbound, the view of the developed property will be the lava and moss rock perimeter wall and dual driveway entrances with entry gates.

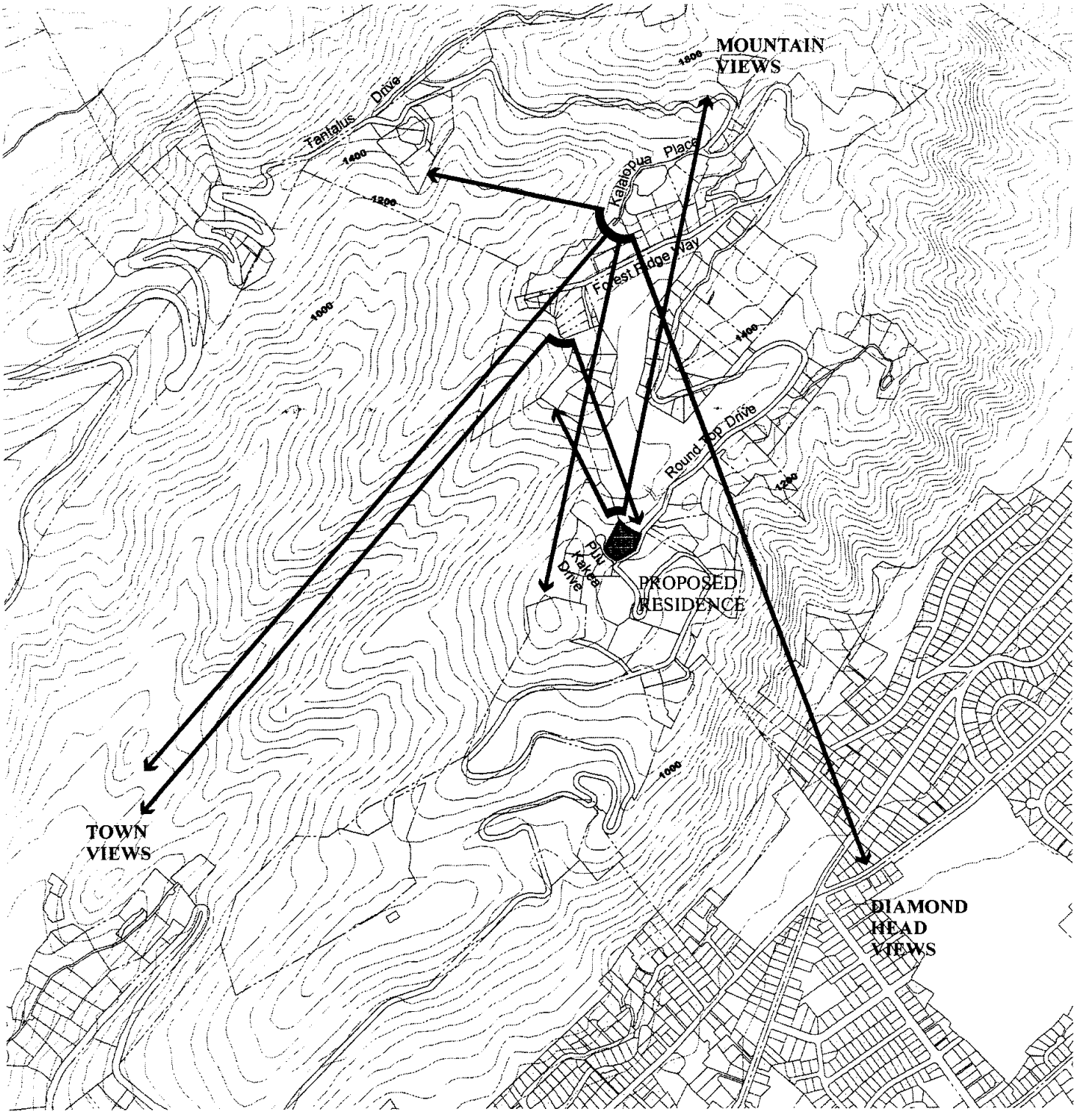

FIGURE 7
VIEW PLANES
Twigg-Smith Residence
Tantalus, Oahu

0 500 1000 Feet 2000

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Setbacks. The design features setbacks from the property line that will retain open space on the property. The setback of the residence from the edge of the lot will meet or exceed the minimum of 15 feet on all sides (HAR, Chapter 13-5, Exhibit 4, "Single Family Residential Standards: September 6, 1994"), as follows:

North setback	43'
South setback	54'
East setback	39'
West setback	15'

Landscaping. The landscaping concept for the residence was developed in consultation with a horticulturalist. The site will be planted with endemic and exotic trees, shrubs and groundcover appropriate for the Tantalus climatic conditions. No mature trees will be removed from the site. The expanses of grass to the north and south of the lot will be replaced with sod and on terraces created by retaining walls. See FIGURE 10, **Conceptual Landscaping Plan**.

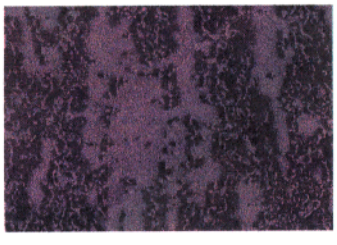
Colors. A dark green/brown pallette will be used throughout the exterior of the residence. Lava and moss rock veneers will mask concrete or concrete block structures. Details of the proposed colors and finishes for the structure are shown in TABLE 1, **Exterior Finish of Structures**.

Naked-eye view toward Twigg-Smith property from Kalaiopua Loop.

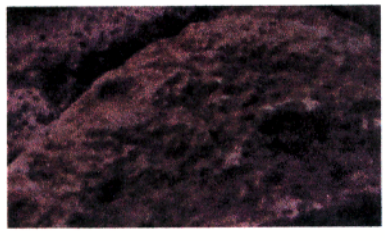
FIGURE 8
NAKED-EYE VIEW TOWARDS PROPERTY
FROM KALAIOPUA LOOP
Twigg-Smith Residence
Tantalus, Oahu

NOT TO SCALE

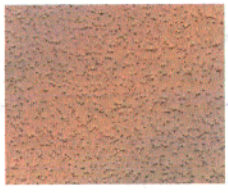
R. M. TOWILL CORPORATION March 2002



Roof color



Lava or moss rock veneer



Stucco color

FIGURE 9
TELEPHOTO VIEW TOWARDS PROPERTY FROM KALAIOPUA LOOP, WITH RESIDENCE SUPERIMPOSED
Twigg-Smith Residence
Tantalus, Oahu

NOT TO SCALE

R. M. TOWILL CORPORATION March 2002

TABLE 1

Twigg-Smith Residence

Exterior Finish of Structures

Structure	Exterior Finish
Roofing	Aluminum shake roofing in gray-brown weathered wood color
Copper Gutters and Fascia	Weathered green copper color
1 X 4 Cedar Soffits (Overhang)	Painted grey-brown
Exterior Walls	Mixture of brown/tan synthetic stucco with lava rock veneer
Windows and Doors	Aluminum metal frames with powder coat finish in dark brown
Support Columns	Cast concrete with lava rock veneer
Patio and Lanai Areas	Quartzite stone in grey color
Driveways	Rock salt finish concrete, stained a green/brown moss color

Source: James Cox, Designer

CHAPTER 4
SOCIO-ECONOMIC CONDITIONS - IMPACTS AND MITIGATION MEASURES

4.1 DEMOGRAPHICS, POPULATION AND ECONOMIC CHARACTERISTICS

Census Block #32, containing the proposed residence (entitled "Roundtop/Tantalus"), had a resident population of 885 in 2000 compared to 853 in 1990. Thus the community is considered a relatively stable residential area. Population in the Makiki/Lower Punchbowl/Tantalus Neigborhood Board area tends to be older than the island as a whole. In 2000, nearly 18 percent of the area's population was 65 years of age (State of Hawaii, Department of Business, Economic Development and Tourism, 2001).

4.1.1 Impacts and Mitigation Measures

Development of the proposed residence will not materially change the character of the neighborhood since Tantalus is already a residential neighborhood with many homes of a character similar to that proposed by the applicants. On a short-term basis, the proposed project will support construction and construction-related employment. In the long term, the proposed single-family residence will not have an impact on employment opportunities, nor will it have a significant impact on population levels. Therefore, no mitigation measures are necessary or proposed.

CHAPTER 5
PUBLIC SERVICES - IMPACTS AND MITIGATION MEASURES

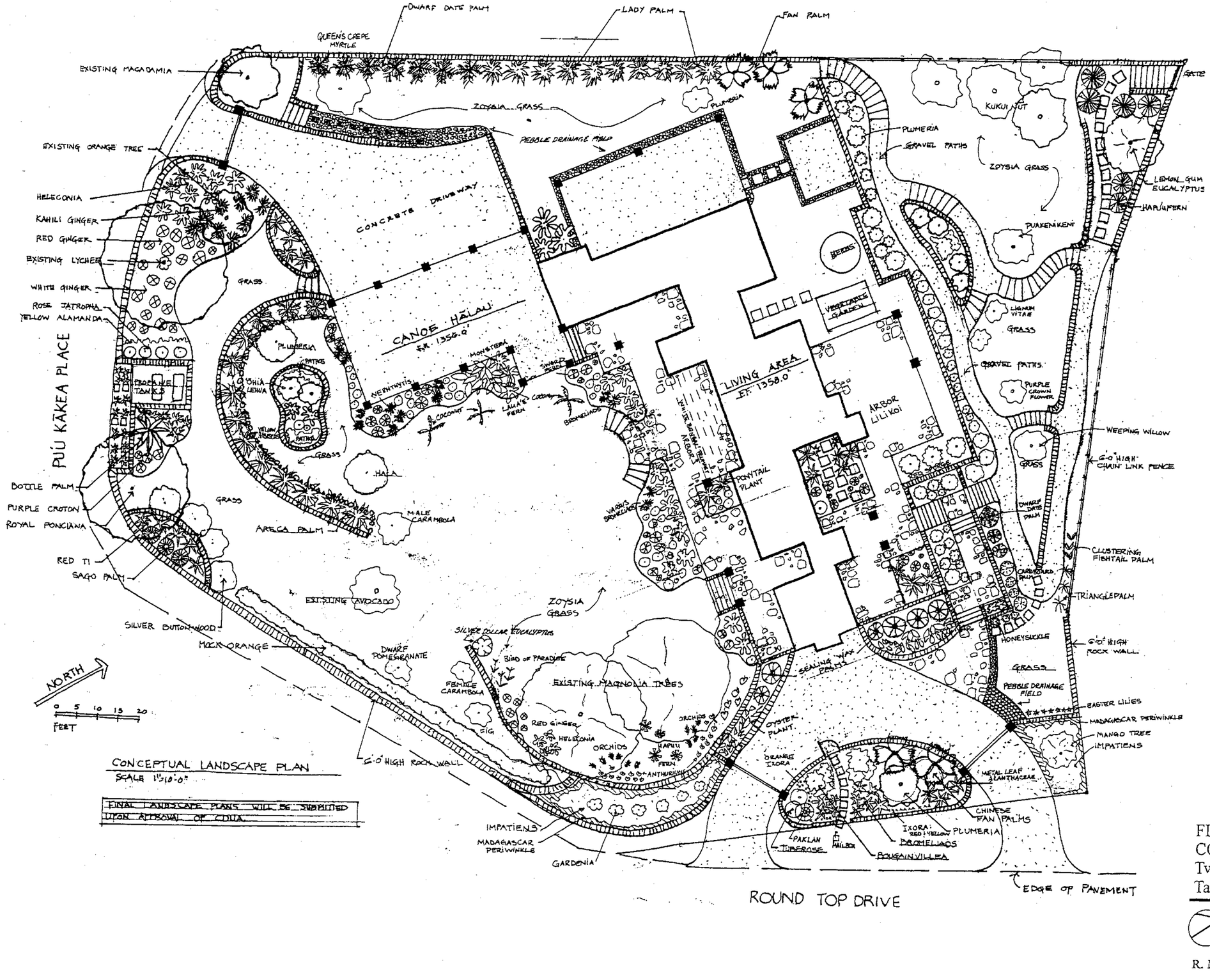
5.1 TRAFFIC AND ROADWAYS

Primary access to the subject property will be from Round Top Drive. Round Top Drive is a winding, two-lane roadway that connects with Tantalus Drive further mauka of the subject property. It is constructed of asphalt concrete, averages 20 feet in width, and provides access to the numerous homes located on Tantalus as well as scenic vistas of urban Honolulu. The portion of Round Top Drive fronting the subject site is maintained by the City (Personal communication, Faith Miyamoto, City Department of Transportation Services, February 2002).

Secondary access to the residence will be via Puu Kakea Place, a private roadway . This cul-de-sac provides access from Round Top Drive to each of the five lots in the subdivision. It is paved in asphalt concrete and is 20 feet wide. The bulb of the cul-de-sac is 72 feet in diameter.

5.1.1 Impacts and Mitigation Measures

The proposed action is not expected to significantly alter the total volume of traffic on Round Top Drive. Construction trucks will enter and exit from the Puu Kakea Place. On a short-term basis, construction-related work on the proposed project may impact traffic flow on Round Top Drive. However, primary access for construction vehicles will be through Puu Kakea Place. Short-term impacts are not considered significant since Round Top Drive will remain open at all times and project-



CONCEPTUAL LANDSCAPE PLAN
SCALE 1"=10'-0"

FINAL LANDSCAPE PLANS WILL BE SUBMITTED UPON APPROVAL OF CDUA

FIGURE 10
CONCEPTUAL LANDSCAPE PLAN
Twigg-Smith Residence
Tantalus, Oahu

0 10 20 Feet 40

R. M. TOWILL CORPORATION March 2002

related delays experienced by motorists, if any, are anticipated to be minor.

Connections of driveway areas with Round Top Drive will be approved as part of the building permit for the residence. The Department of Transportation Services expects no negative impact on the City roadway to result from canoe trailer traffic to and from the residence (Personal communication, Faith Miyamoto, Department of Transportation Services, February 2002; APPENDIX C).

The Round Top Drive boundary of the property will have a gated, semi-circular driveway with a lava and moss lava and moss rock wall between the two access points (FIGURE 3, **Site Plan**). Design of the driveway entrances will ensure that gates are placed a minimum of one car length from Round Top Drive. In addition, adequate turning radii will be maintained for entering and leaving the driveways and the placement and use of driveways along Round Top Drive will not result in a "blind driveway" condition. The wall adjacent to the south access point is set back from the property line, improving driver visibility when entering and exiting the property. The visual space around the property is also improved by this increased setback.

5.2 WASTEWATER

The Tantalus area is not served by the municipal sewer system. Therefore all treatment of wastewater must be performed on-site through a wastewater treatment system designed to dispose of approximately 600 gallons of domestic effluent per day (using the standard of 200 gallons per bedroom). The system will consist of an underground septic tank with a capacity of 1,250 gallons and an 800-square foot leach field along the property's western boundary and will be unencumbered by the driveway off Puu Kakea Place (FIGURE 3, **Site Plan**). This area of the property is relatively level. DLNR File No. OQA-7/6/89-2289 provides an Individual Wastewater System for each of the five lots of the subdivision. This was confirmed in consultation with the Department of Health in March 2002.

The Department of Health *Recommended Standards* (Chapter 10) indicate that leach fields (absorption trenches) should not be used in soils with a percolation rate slower than 60 minutes per inch. Percolation rates measured during preliminary geotechnical testing of the project site showed more rapid percolation rates of 4.21 and 6.67 minutes per inch. Therefore, geotechnical engineers concluded that

"leach fields (absorption trenches) may be used for disposal of septic sewage effluent" on the project site (Shinsato Engineering, Inc., 2001, APPENDIX A).

5.2.1 Impacts and Mitigation Measures

The individual wastewater treatment system for the proposed residence will conform with Hawaii Administrative Rules, Chapter 11-62, "Wastewater Systems."

Based on the elevation of the proposed individual wastewater treatment system and the nature of the soil percolation rate, the septic system and leaching field are not expected to result in adverse impacts.

5.3 RECREATIONAL RESOURCES

For many years the Tantalus area has successfully combined residential uses with a series of public trails. In the vicinity of the subject property are the Makiki Valley Trail, Moleka Trail and Manoa Cliff Trail.

5.3.1 Impacts and Mitigation Measures

Consultation with managers of Na Ala Hele, the State trail management program of DLNR, indicated the subject project will not be visible from the above-cited trails (Personal communication, Curt Cottrell, February 2002). Therefore there are no expected effects on recreational resources from the project and no mitigation measures are proposed.

5.4 POTABLE WATER

The Board of Water Supply does not serve Tantalus. Domestic water for the residence will be supplied from an on-site catchment system and storage cistern. There also is no groundwater in the vicinity of the residence: according to a 2001 soils investigation of the subject property, four test borings to depths of 15 to 25 feet were conducted and no groundwater was encountered. (Shinsato Engineering, Inc.; Soils Investigation Report Proposed Twigg-Smith Residence; November 15, 2001, APPENDIX A).

5.4.1 Impacts and Mitigation Measures

No adverse impacts will occur with regard to the potable water supply, due to the absence of municipal water in the area and the owners' intention to install an individual water catchment system. No

mitigation measures are necessary.

5.5 SOLID WASTE

Solid waste from the proposed project will be disposed of by the City collection system.

5.5.1 Impacts and Mitigation Measures

The impact to solid waste collection services will be one additional family in the Tantalus neighborhood. Consultation with the City Department of Environmental Services, Refuse Division, indicates that the current collection system will not be materially affected by the proposed single family residence (Personal communication, February 2002).

5.6 POLICE AND EMERGENCY SERVICES

The Tantalus area is served by the Honolulu Police Department and Emergency Services Department.

5.6.1 Impacts and Mitigation Measures

There will be no significant impact on police or emergency services as a result of the proposed single family residence. No mitigation measures are needed.

5.7 FIRE PROTECTION SERVICES

The property is under the jurisdiction of the Honolulu Fire Department. However, the residence is not served by municipal water for firefighting purposes.

5.7.1 Impacts and Mitigation Measures

As part of the building permit process, the applicant will develop a fire contingency plan that will be approved by the appropriate agencies, and will provide necessary fire protection to the subject property. This will include a sprinkler system within the residence which will draw water from the 69,000-gallon in-ground cistern. A Fire Department hookup connected to the cistern pump room will be installed on the Puu Kakea (south) side of the residence. This system will meet the Fire Department standard for fire fighting which is 1,000 gallons of water flow per minute for 60 minutes (City and County of Honolulu, Board of Water Supply, Water System Standards, Volume I, 1985).

5.8 ELECTRICAL AND COMMUNICATION FACILITIES

Electrical power for the Tantalus neighborhood is provided by Hawaiian Electric Company; Telephone service by Verizon Hawaii; and cable service by Oceanic Cable. Existing electrical, telephone and cable connections are located on the property in an easement along its boundary on Puu Kakea Place. Propane gas for the proposed residence will provide fuel for cooking, domestic hot water, generator and radiant heat. Two 124-gallon propane tanks will be located on the property along Puu Kakea Place near the existing electrical and cable easement (see FIGURE 3, **Site Plan**).

5.8.1 Impacts and Mitigation Measures

No adverse impacts are expected from the single family residence connecting to existing facilities. The propane tanks for heating, cooking, and emergency electricity generation will be constructed according to standards of the City and County of Honolulu and The Gas Company (FIGURE 3, **Site Plan**). These include installation of the tanks on a concrete pad a minimum of 10 feet from the property line and a minimum of 10 feet from any ignition source. The propane tanks on the Puu Kakea Place area of the property will be surrounded on three sides by a lava and moss lava and moss rock retaining wall and a lockable gate on the fourth side to provide access for The Gas Company.

CHAPTER 6
RELATIONSHIP TO LAND USE POLICIES AND CONTROLS OF THE AFFECTED AREA

6.1 OVERVIEW

State and County policy, land use plans and controls are established to guide development in a manner that enhances the overall living environment of Hawaii, and that ensures the long-term social, economic, environmental, and land use needs of Hawaii are met. The use of the site for single family residential development is in accordance with State and County land use plans and policies, as discussed below.

6.2 HAWAII STATE PLAN AND FUNCTIONAL PLANS

The Hawaii State Plan, adopted in 1978, consists of three parts:

- An overall theme with broad goals, objectives and policies
- A system designed to coordinate public planning to implement the goals, objectives and policies of the State Plan; and
- Priority guidelines which are statements of Statewide interrelated problems deserving immediate action.

The State Functional Plans are intended to provide more detail for implementing the State Plan. They guide State and County actions under specific functional topics. One functional plan related to the development of the Twigg-Smith residence is the State Housing Functional Plan. The goal for housing is to:

Develop greater opportunities for Hawaii's people to secure reasonably priced, safe, sanitary ,livable homes located in suitable environments that satisfactorily accommodate the needs and desires of families and individuals (Housing Functional Plan, 1991).

The project will fulfill the housing needs of the Twigg-Smith family.

Another State Functional Plan that is relevant to this project is the State Conservation Lands Functional Plan, whose objective is:

The objective of the State Conservation Functional Plan is provide for a management program allowing for judicious use of the State's natural resources balanced with the need to protect these resources to varying degrees."

"Judicious use" of Conservation District resources and lands includes the provision for single family residences, as detailed in the Hawaii Administrative Rules, Chapter 13-5 (Section 6.3 following).

6.3 STATE LAND USE LAW AND REGULATION OF THE CONSERVATION DISTRICT

The State Land Use Commission classifies all lands in the State of Hawaii into one of four land use designations: Urban, Rural, Agricultural and Conservation. The proposed residence is in the State

Conservation District. Land uses in the Conservation District are regulated by the State Department of Land and Natural Resources. Hence, the project must conform to requirements of Hawaii Administrative Rules, Title 13, Subtitle 1 Administration, Chapter 5, "Conservation District," which regulates all Hawaii lands within the conservation land use designation. Chapter 13-5 divides the Conservation District into subzones and provides for identified land uses in each subzone. The subject property is located in the Resource Subzone, in which the proposed use falls under identified land use "R-8, (D-1) A single family residence that conforms to design standards of this chapter [Chapter 13-5]."

The existing subdivision is one of five lots approved in 1989 for residential development within the Conservation District. This Environmental Assessment supports a Conservation District Use Application (CDUA) which describes how the proposed residence will conform with the design standards set forth in Chapter 13-5. The CDUA must be approved by the Board of Land and Natural Resources before any development can occur.

6.4 CITY AND COUNTY OF HONOLULU GENERAL PLAN

The current edition of the City and County of Honolulu General Plan was adopted in 1992. The Plan is a comprehensive statement of objectives and policies for Honolulu's future development. It presents the basic growth policy for Oahu which calls for "full development of the Primary Urban Center (the area from Kahala to Pearl City), development of the secondary urban center at Kapolei and the Ewa and Central Oahu urban-fringe areas, and managing the physical growth and development in the remaining urban-fringe and rural areas to sustain their low density or rural characteristics" (http://honolulu/dpp/org/planning/92plan).

The proposed residence is located in the Primary Urban Center. The Population Objective of the General Plan, Objective C, is "to establish a pattern of population that will allow the people of Oahu to live and work in harmony." Policy 1 calls for the City and County of Honolulu to "Facilitate the full development of the Primary Urban Center" (http://honolulu/dpp/org/ planning/92plan). This project is consistent with the Oahu General Plan's basic growth policy of the "full development of the Primary Urban Center."

6.5 PRIMARY URBAN CENTER DEVELOPMENT PLAN

Oahu is divided into 8 planning areas. Each area has a Development Plan which implements the objectives and policies of the General Plan and guides the long-range land use and infrastructure planning for each area. The subject property is located in the Primary Urban Center area where residential development has existed for over 100 years. The currently-approved Primary Urban Center Development Plan is included in the Revised Ordinances of Honolulu as Ordinance 81-79. A draft update of the Development Plan was prepared in 1995. The next step is review by the Honolulu Planning Commission. The draft identifies areas such as Tantalus as established neighborhoods where infill may occur but multi-unit development is discouraged. The plan also advocates development that retains the character of established neighborhoods (Personal communication, Bob Stanfield, Department of Planning and Permitting, March, 2002).

This project is consistent with the Primary Urban Center Development Plan because it constitutes infill established neighborhoods with single family residential development. In addition, the home has been designed to preserve the character of this established neighborhood.

6.6 COUNTY ZONING

Tantalus is zoned by the City as Preservation (P-1, Restricted Preservation). Land uses in the Preservation Zone are regulated solely by the State DLNR in accordance with the rules governing the State Conservation District (see Section 6.3). As such, the residence is meets the development standards of Chapter 13-5, Hawaii Administrative Rules, which governs land use within the State Conservation District.

CHAPTER 7
NECESSARY PERMITS AND APPROVALS

For the proposed project the applicant is required to obtain from the State of Hawaii, Board of Land and Natural Resources approval for a Conservation District Use Permit. From the City & County of Honolulu, Department of Planning and Permitting, the applicant will need building and grading permits.

CHAPTER 8
AGENCIES AND ORGANIZATIONS CONSULTED

Federal

Department of the Interior, U.S. Fish and Wildlife Service

State of Hawaii

- Department of Business, Economic Development, and Tourism, Office of Planning
- Department of Health, Environmental Planning Office
- Department of Health, Clean Water Branch
- Department of Land and Natural Resources, Division of Forestry and Wildlife (Na Ala Hele), State Historic Preservation Division, and Land Division.
- Department of Transportation

City & County of Honolulu

- Department of Planning and Permitting
- Department of Transportation Services
- Honolulu Fire Department
- Department of Environmental Services

Others

- Makiki/Lower Punchbowl/Tantalus Neighborhood Board #10
- Tantalus Community Association
- Mrs. Adeline T. Brash, 3851 Puu Kakea Place, Honolulu, Hawaii, 96822 (homeowner, Brash Subdivision; oral history)

CHAPTER 9
DETERMINATION OF SIGNIFICANCE

Based on significance criteria set forth in Hawaii Administrative Rules, Title 11, Department of Health, Chapter 200, "Environmental Impact Statement Rules," the proposed project is not expected to have a significant impact on the environment. As such, the recommended preliminary determination for the proposed project is a Finding of No Significant Impact (FONSI). The findings and reasons supporting this determination are discussed below.

1. Involves an irrevocable commitment to loss or destruction of any natural or cultural resource

The proposed project will not result in a loss of natural or cultural resources. The proposed action will create minimum disturbance to the present vegetation in the area. Two large magnolia trees on the property will remain. In addition, new trees, shrubs, and groundcover will be planted. There are no threatened or endangered species of plants or wildlife that inhabit the project site. The majority of the site will remain in its natural state.

There are no known archaeological sites on the subject property. Furthermore, given the location and previous development of the subject property, historic sites are not expected to be present. In consultation with the DLNR State Historic Preservation Division, it has been determined that the proposed project will have "no effect" on any historic or cultural resources (Personal communication, Elaine Jourdaine, February 2002).

2. Curtails the range of beneficial uses of the environment

Presently, the subject property is vacant. The proposed single-family residence is an identified land use in the Conservation District, Resource Subzone, according to §13-5-24 of the Hawaii Administrative Rules. This lot was created under CDUA File No. OA-7/6/89-2289 for the specific purpose of single-family residential use. The proposed action does not curtail beneficial uses of the environment.

3. **Conflicts with the State's long-term environmental policies or goals and guidelines as expressed in Chapter 343, HRS, and any revisions thereof and amendments thereto, court decisions, or executive orders**

The proposed project has been planned and designed in conformance with the environmental policies and guidelines established in Chapter 343, HRS. The subject property is not under an Executive Order.

4. **Substantially affects the economic and social welfare of the community or state**

The proposed project is minor in scope and will not impact the economy or social welfare of the community or state.

5. **Substantially affects public health**

Factors affecting public health, including air quality, water quality, and noise levels, are expected to be only minimally affected, or unaffected by the construction and use of the Twigg-Smith residence. Potential impacts will be mitigated in accordance with Department of Health regulations.

6. **Involves substantial secondary impact, such as population changes or effects on public facilities**

Due to the nature of the proposed single family residence, there are no substantial secondary or indirect impacts such as population changes or effects on public facilities.

7. **Involves a substantial degradation of environmental quality**

Impacts to air and water quality, noise levels, natural resources, and land use associated with the construction and occupation of the Twigg-Smith residence are anticipated to be minimal. Mitigation measures will be employed as practicable to further minimize potentially detrimental effects to the environment resulting from project activities. The proposed project does not involve substantial

degradation of environmental quality.

8. Is individually limited but cumulatively has considerable effect upon the environment or involves a commitment for larger actions

The proposed single family residence is relatively minor in scope and adverse cumulative impacts on the environment are not anticipated, nor does the proposed project involve a commitment for larger actions on the subject property.

9. Substantially affects a rare, threatened or endangered species

There are no threatened or endangered plant or animal species on the subject property.

10. Detrimentally affects air or water quality or ambient noise levels

On a short-term basis, ambient air and noise conditions will be affected by construction activities related to the proposed single-family residence, but these impacts can be controlled by measures described in the Environmental Assessment. Once the project is completed, air and noise conditions in the project vicinity should return to their present levels.

11. Affects or is likely to suffer damage by being located in an environmentally sensitive area such as a flood plain, tsunami zone, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters

The project site is located inland from any coastal waters within an area determined by the Federal Emergency Management Agency to be outside of the 500 year flood zone. Based on area topography, the project site is unlikely to be affected by flooding. All structures proposed for this project will be built according to equivalent standards for seismic zone 1, as established by the Uniform Building Code. The project is not located in an environmentally sensitive area and is unlikely to affect or suffer damage from natural forces such as flooding, hurricanes or earthquakes.

12. Substantially affects scenic vistas and viewplanes identified in county or state plans or studies

The Primary Urban Center Development Plan (Ordinance No. 81-79) identifies important views to be protected. From public places in urban Honolulu, these include: mauka views of the Koolau mountain range, ridges, and valleys; views of forest areas; and views to the mountains from streets and other public areas in Waikiki. From a regional perspective, the proposed project will not obstruct the above-mentioned views, due to the great viewing distance, it is behind Puu Kakea, and the fact that the mountain is very heavily vegetated. The proposed project will be constructed below tree heights in the vicinity. The residence will not interfere with any views of the Tantalus ridgeline from urban Honolulu.

13. Requires substantial energy consumption

Construction and daily activities associated with the proposed single-family residence are small-scale and will not require substantial amounts of electrical energy.

FINDINGS

In accordance with the provisions set forth in Chapter 343, Hawaii Revised Statutes, and the significance criteria in Section 11-200-12 of Title 11, Chapter 200, it is anticipated that the project will have no significant adverse impact to water quality, air quality, existing utilities, noise levels, social welfare, archaeological sites, or wildlife habitat. All anticipated impacts will be temporary and will not adversely impact the environmental quality of the area. It is expected that an Environmental Impact Statement (EIS) will not be required, and that a Finding of No Significant Impact (FONSI) will be issued for this project.

REFERENCES

City and County of Honolulu, Land Use Ordinance, May, 1999.

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APPENDIX A

Percolation Test Report
and
Report, Soils Investigation
Proposed Twigg-Smith Residence, 3868 Round Top Drive, Honolulu, Hawaii, TMK: 2-5-18:33

By Shinsato Engineering, Inc.

November 15, 2001

SHINSATO ENGINEERING, INC.

CONSULTING GEOTECHNICAL ENGINEERS

98-747 KUAHAO PLACE, PEARL CITY, HAWAII 96782
PHONE: (808) 487-7855
FAX: (808) 487-7854

March 26, 2002
Project No. 01-0134

Mr. and Mrs. Michael Twigg-Smith
3007 Hibiscus Drive
Honolulu, Hawaii 96815

Subject: **Revised Percolation Test Report**
Proposed Twigg-Smith Residence
3868 Round Top Drive
Honolulu, Hawaii
TMK: 2-5-18: 33

Dear Mr. and Mrs. Twigg-Smith:

This is to provide you with a revised report of percolation tests performed at the subject property.

Field Work

Two (2) percolation tests (P-1 and P-2) were performed at the site on October 31, 2001 at the easterly portion of the property. Subsequent to this, the proposed leach field location was moved to the westerly side of the property. Two (2) additional percolation tests (P-3 and P-4) were performed on March 22, 2002 at the new location.

The percolation tests were performed in 4-inch diameter holes augered to depths of 5 to 8 feet below grade. The locations of the percolation tests are shown on the Plot Plan, Plate 2.

The percolation tests were performed using test procedures developed by the Robert A. Taft Sanitary Engineering Center. In general, this consists of drilling the test hole, filling the bottom with 2 inches of coarse sand and then saturating the hole with water (overnight for clayey soils). The test is conducted by filling the hole with clear water and then measuring the drop in water level with time. The results of the measurements are used to determine the percolation rate.

Soil Conditions

According to the U.S.D.A. Soil Conservation Service "Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai and Lanai, State of Hawaii", the site is located in an area classified as Tantalus silt loam, 40 to 70 percent slopes (TAF). This consists of well-drained soils on uplands that developed in volcanic ash and material weathered from cinders (USDA, 1972, pg. 121, Plate 62). The soil survey manual indicates that for the TAF portion of the Tantalus series, the degree and kind of limitations for septic tank filter fields are "severe, slopes generally more than 10 percent; lack of filter material" (USDA, 1972, pp. 196-197).

Percolation tests P-1 and P-2 encountered brown, silty SAND to the final depths of the borings at 60 inches. Test P-3 encountered brown, elastic SILT to a depth of 90 inches followed by brown silty

SAND to the final depth of the boring at 8 feet. Test P-4 encountered brown elastic SILT to a depth of 30 inches followed by brown silty SAND to the final depth of the boring at 60 inches.

Test borings were drilled for the proposed house area to depths of 15 to 25 feet. No groundwater was encountered in the borings.

Logs of the borings are shown on the attached Site Evaluation/Percolation Test forms.

Percolation Test Results

The calculated percolation rates are as follows:

Boring No.	Test Depth	Percolation Rate
P-1	60 inches	4.21 minutes/inch
P-2	60 inches	6.67 minutes/inch
*P-3	96 inches	5.52 minutes/inch
P-4	60 inches	3.64 minutes/inch

*NOTE: At P-3, percolation testing was initially performed at 60 inches. The soil was found to have a slow percolation rate (187 minutes for 12-inches of soak). The hole was deepened to 96 inches and then tested with the percolation results as listed above.

Conclusions and Recommendations

The Department of Health Recommended Standards (Chapter 10) indicate that leach fields (absorption trenches) should not be used in soils with a percolation rate slower than 60 minutes per inch. Based on the results of the tests, it is concluded that leach fields (absorption trenches) may be used for disposal of septic sewage effluent.

It should be noted that at the new leach field locations (west side of property), the soil with a good percolation rate is the underlying silty SAND deposit found at 90 inches at P-3 and 30 inches at P-4.

Should you have any questions or require any further information, please do not hesitate to contact us.

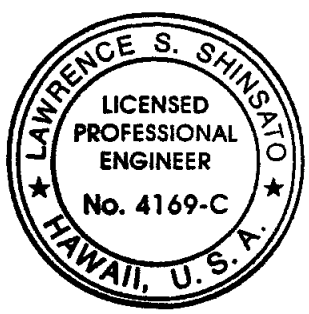
Very truly yours,

SHINSATO ENGINEERING, INC.

Lawrence S. Shinsato, P.E.
President

LSS:ls

Attachment/



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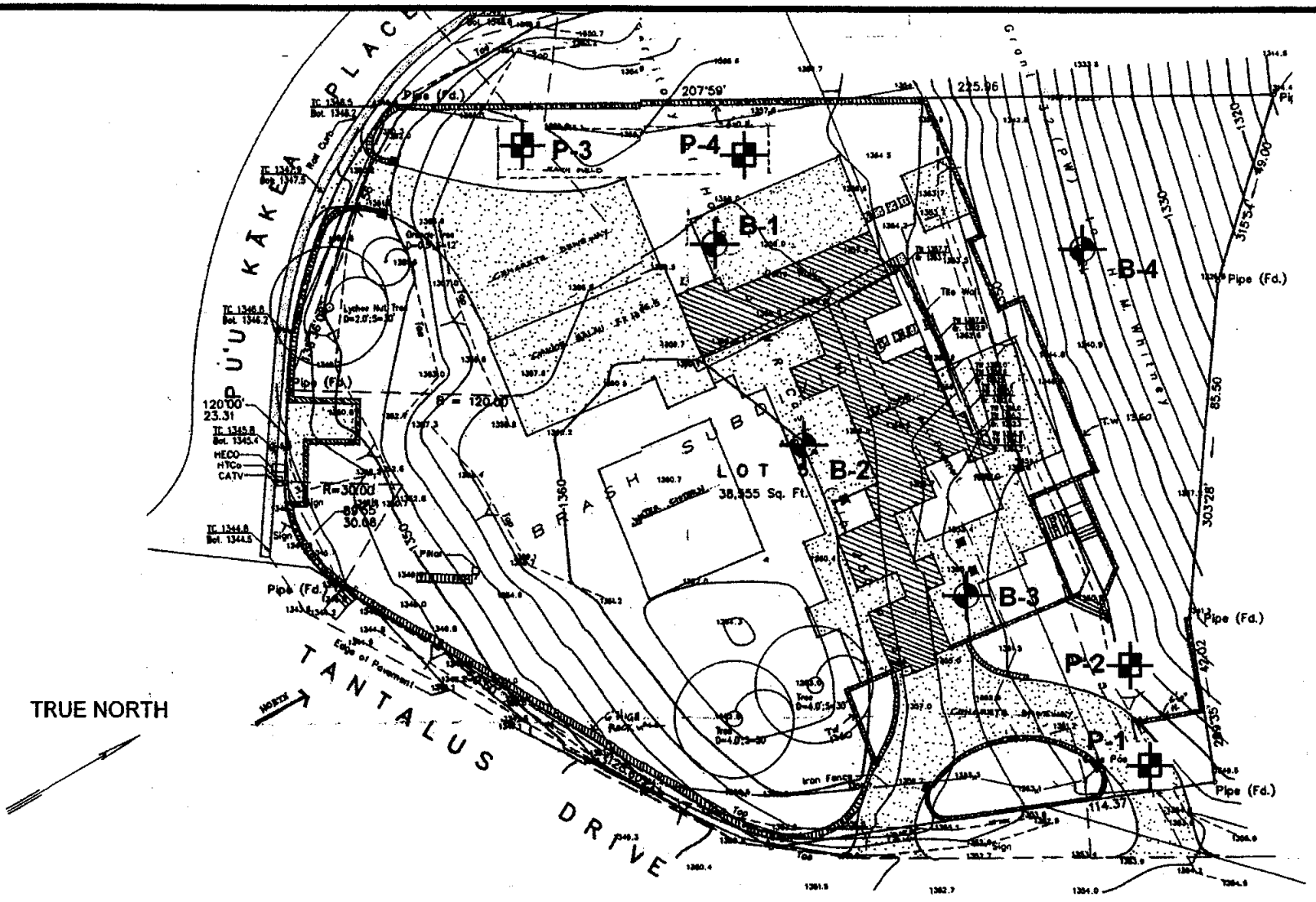


PLOT PLAN
SCALE: 1" = 40'

LEGEND:

- BORING LOCATION
- PERCOLATION TEST LOCATION

Project:	TWIGG-SMITH RESIDENCE ROUNDTOP DRIVE
Project No.:	01-0134

SHINSATO ENGINEERING, INC.
CONSULTING GEOTECHNICAL ENGINEERS
98-747 KUAHAO PL. PEARL CITY, HI 96782

PLATE 2

SITE EVALUATION/PERCOLATION TEST

Percolation Test P-1

Date/Time: October 31, 2001/10:36 am

Test performed by: Shinsato Engineering, Inc.

Owner: Mr. and Mrs. Michael Twigg-Smith

Tax Map Key: 2-5-18: 33

Elevation:	+1352	ft.
Depth to Groundwater Table:	N/A	below grade
Depth to Bedrock (if observed):	N/A	ft. below grade
Diameter of Hole:	4.0	in.
Depth to Hole Bottom:	5.0	ft. below grade

Depth, inches below grade	Soil Profile (color, texture, other)
0 - 60"	brown silty SAND(cinders); with gravel

PERCOLATION READINGS

Time 12 in. of water to seep away: 20 min.
Time 12 in. of water to seep away: 30 min.

Check one:

X Percolation tests in sandy soils, recorded time intervals and water drops at least every 10 minutes for at least 1 hour.

Percolation tests in non-sandy soils, presoaked the test hole for at least 4 hours. Recorded time intervals and water drops at least every 10 minutes for 1 hour or if the time for the first 6 inches to seep away is greater than 30 minutes record time intervals and water drops at least every 30 minutes for 4 hours or until successive drops do not vary by more than 1/16 inch.

Time interval (min.)	Drop in inches	Time interval (min.)	Drop in inches
10	2-5/8"	10	2-3/8"
10	2-3/8"	10	2-3/8"
10	2-1/2"	10	2-3/8"

Percolation Rate (time/final water level drop): 4.21 min/in

As the engineer responsible for gathering and providing site information and percolation test results, I attest to the fact that above site information is accurate and that the site evaluation was conducted in accordance with the provisions of Chapter 11-62, "Wastewater Systems" and the results were acceptable. I also attest that three feet of suitable soil exists between the bottom of the soil absorption system and the groundwater table or any other limiting layer.

LAWRENCE S. SHINSATO
LICENSED PROFESSIONAL ENGINEER
No. 4169-C
HAWAII, U.S.A.

Engineer's Signature/Stamp

SITE EVALUATION/PERCOLATION TEST

Percolation Test P-2

Date/Time: October 31, 2001/10:36 am

Test performed by: Shinsato Engineering, Inc.

Owner: Mr. and Mrs. Michael Twigg-Smith

Tax Map Key: 2-5-18: 33

Elevation:	+1348	ft.
Depth to Groundwater Table:	N/A	below grade
Depth to Bedrock (if observed):	N/A	ft. below grade
Diameter of Hole:	4.0	in.
Depth to Hole Bottom:	5.0	ft. below grade

Depth, inches below grade	Soil Profile (color, texture, other)
0 - 60"	brown silty SAND(cinders); with gravel

PERCOLATION READINGS

Time 12 in. of water to seep away: 32 min.
Time 12 in. of water to seep away: 42 min.

Check one:

X Percolation tests in sandy soils, recorded time intervals and water drops at least every 10 minutes for at least 1 hour.

Percolation tests in non-sandy soils, presoaked the test hole for at least 4 hours. Recorded time intervals and water drops at least every 10 minutes for 1 hour or if the time for the first 6 inches to seep away is greater than 30 minutes record time intervals and water drops at least every 30 minutes for 4 hours or until successive drops do not vary by more than 1/16 inch.

Time interval (min.)	Drop in inches	Time interval (min.)	Drop in inches
10	1-1/2"	10	1-5/8"
10	1-15/16"	10	1-1/2"
10	1-7/8"	10	1-1/2"
10	1-3/4"		

Percolation Rate (time/final water level drop): 6.67 min/in

As the engineer responsible for gathering and providing site information and percolation test results, I attest to the fact that above site information is accurate and that the site evaluation was conducted in accordance with the provisions of Chapter 11-62, "Wastewater Systems" and the results were acceptable. I also attest that three feet of suitable soil exists between the bottom of the soil absorption system and the groundwater table or any other limiting layer.

LAWRENCE S. SHINSATO
LICENSED PROFESSIONAL ENGINEER
No. 4169-C
HAWAII, U.S.A.

Engineer's Signature/Stamp:

SITE EVALUATION/PERCOLATION TEST

Percolation Test P-3

Date/Time: March 22, 2002; 10:30 am

Test performed by: Shinsato Engineering, Inc.

Owner: Mr. and Mrs. Michael Twigg-Smith

Tax Map Key: 2-5-18: 33

Elevation:	+1356	ft.
Depth to Groundwater Table:	N/A	below grade
Depth to Bedrock (if observed):	N/A	ft. below grade
Diameter of Hole:	4.0	in.
Depth to Hole Bottom:	8.0	ft. below grade

Depth, inches below grade	Soil Profile (color, texture, other)
0 - 24"	brown, mod. stiff elastic SILT, with gravel and sand
24" - 72"	with dark gray brown layers of organics
72" - 90"	with cobbles
90" - 96"	brown, mod. dense silty SAND(cinders); with cobbles and gravel

PERCOLATION READINGS

Time 12 in. of water to seep away: 23 min.
Time 12 in. of water to seep away: 33 min.

Check one:

X Percolation tests in sandy soils, recorded time intervals and water drops at least every 10 minutes for at least 1 hour.

Percolation tests in non-sandy soils, presoaked the test hole for at least 4 hours. Recorded time intervals and water drops at least every 10 minutes for 1 hour or if the time for the first 6 inches to seep away is greater than 30 minutes record time intervals and water drops at least every 30 minutes for 4 hours or until successive drops do not vary by more than 1/16 inch.

Time interval (min.)	Drop in inches	Time interval (min.)	Drop in inches
10	2"	10	1-7/8"
10	1-7/8"	10	1-13/16"
10	1-13/16"		
10	1-13/16"		

Percolation Rate (time/final water level drop): 5.52 min/in

As the engineer responsible for gathering and providing site information and percolation test results, I attest to the fact that above site information is accurate and that the site evaluation was conducted in accordance with the provisions of Chapter 11-62, "Wastewater Systems" and the results were acceptable. I also attest that three feet of suitable soil exists between the bottom of the soil absorption system and the groundwater table or any other limiting layer.

LAWRENCE S. SHINSATO
LICENSED PROFESSIONAL ENGINEER
No. 4710-C
HAWAII, U.S.A.

Engineer's Signature/Stamp

SITE EVALUATION/PERCOLATION TEST

Percolation Test P-4

Date/Time: March 22, 2002; 10:30 am

Test performed by: Shinsato Engineering, Inc.

Owner: Mr. and Mrs. Michael Twigg-Smith

Tax Map Key: 2-5-18: 33

Elevation:	+1357	ft.
Depth to Groundwater Table:	N/A	below grade
Depth to Bedrock (if observed):	N/A	ft. below grade
Diameter of Hole:	4.0	in.
Depth to Hole Bottom:	5.0	ft. below grade

Depth, inches below grade	Soil Profile (color, texture, other)
0 - 30"	brown, mod. stiff elastic SILT, with gravel and sand
30" - 60"	brown, mod. dense silty SAND(cinders); with cobbles and gravel

PERCOLATION READINGS

Time 12 in. of water to seep away: 11 min.
Time 12 in. of water to seep away: 16 min.

Check one:

X Percolation tests in sandy soils, recorded time intervals and water drops at least every 10 minutes for at least 1 hour.

Percolation tests in non-sandy soils, presoaked the test hole for at least 4 hours. Recorded time intervals and water drops at least every 10 minutes for 1 hour or if the time for the first 6 inches to seep away is greater than 30 minutes record time intervals and water drops at least every 30 minutes for 4 hours or until successive drops do not vary by more than 1/16 inch.

Time interval (min.)	Drop in inches	Time interval (min.)	Drop in inches
10	4-7/8"	10	2-3/4"
10	2-3/4"	10	2-3/4"
10	2-3/4"		
10	2-3/4"		

Percolation Rate (time/final water level drop): 3.64 min/in

As the engineer responsible for gathering and providing site information and percolation test results, I attest to the fact that above site information is accurate and that the site evaluation was conducted in accordance with the provisions of Chapter 11-62, "Wastewater Systems" and the results were acceptable. I also attest that three feet of suitable soil exists between the bottom of the soil absorption system and the groundwater table or any other limiting layer.

LAWRENCE S. SHINSATO ★ LICENSED PROFESSIONAL ENGINEER ★ No. 4168-C ★ HAWAII, U.S.A.

Engineer's Signature/Stamp

REPORT
SOILS INVESTIGATION

PROPOSED TWIGG-SMITH RESIDENCE
3868 ROUND TOP DRIVE
HONOLULU, HAWAII
TMK: 2-5-18: 33

for

MR. AND MRS. MICHAEL TWIGG-SMITH

Project No. 01-0134
November 15, 2001

SHINSATO ENGINEERING, INC.

CONSULTING GEOTECHNICAL ENGINEERS

98-747 KUAHAO PLACE, PEARL CITY, HAWAII 96782
PHONE: (808) 487-7855
FAX: (808) 487-7854

November 15, 2001
Project No. 01-0134

Mr. and Mrs. Michael Twigg-Smith
3007 Hibiscus Drive
Honolulu, Hawaii 96815

Dear Mr. and Mrs. Twigg-Smith:

The attached report presents the results of a soils investigation for your proposed residence to be located at 3868 Round Top Drive in Honolulu, Hawaii.

A summary of the findings is as follows:

1) The subsurface conditions at the site were explored by drilling 4 test borings to depths of 15.0 to 25.0 feet. In general, the borings encountered moderately stiff to very stiff, brown elastic SILT to a depth of 3.0 feet below existing grade followed by medium dense to very loose GRAVEL (CINDERS) to the final depth of the borings. At Boring 2, very dense COBBLES were encountered from 13.5 to 15 feet.

   At Boring 4, moderately stiff to stiff, brown elastic SILT was found to a depth of 3.0 feet followed by loose silty SAND (CINDERS) to a depth of 6.0 feet below existing grade. Below the silty SAND, very loose GRAVEL (CINDERS) was found to a depth of 15.0 feet. Below the GRAVEL at 15.0 feet, the boring was probed using a 2-inch diameter probe rod advanced with a 140-pound driving weight, dropping from a height of 30 inches. At 15.0 feet below existing grade, the material encountered graded to medium dense to the final depth of the boring at 25.0 feet.

2) No groundwater was encountered in any of the borings at the time of the field investigation.

3) Special considerations will be required in the design and construction of the project due to existing site conditions. These include the following:

   a) The bottom of all footing excavations that bear on existing on-site soils shall be compacted prior to constructing the footing.

   b) Construction cuts into the underlying loose GRAVEL and SAND are susceptible to caving. Shoring will likely be required to support deep excavations. Proper safety measures should be taken during construction to protect excavations from cave-ins.

   c) Compaction of fills and backfills shall be performed with static rollers or small vibratory compactors. The use of large vibratory equipment may cause damage to adjacent structures.

4) Based on the findings and observations of this investigation, it is concluded that spread and continuous footings bearing on firm on-site soils, the underlying CINDERS or properly compacted fill may be used to support the proposed structure. A summary of the foundation design parameters is as follows:

a. Allowable soil bearing value: 2,000 psf for footings embedded a minimum of 12 inches below lowest adjacent grade (measured to bottom of footing), and bearing on firm on-site soil, the underlying CINDERS or properly compacted fill. The bearing value may be increased by 250 psf for each additional foot of embedment to a maximum of 3,000 psf.

b. Estimated settlement: less than 3/4 inch

c. Passive earth resistance: 300 pcf

d. Frictional resistance: 0.4 times the dead load for the underlying soils or imported select granular fill

e. Active earth pressure: 30 pcf free-standing wall, level backfill using imported select granular fill or on-site soils; for restrained walls, the active earth pressure shall be increased by 50 percent; additional increase shall be made for surcharge loading and sloping backfill

f. Soil Type Profile: S_E - "soft soil"

g. Slab-on-grade: Conventional slab-on-grade construction may be used.

Details of the findings and recommendations are presented in the attached report.

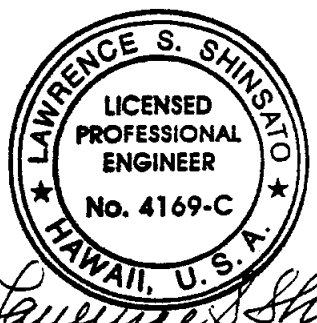
This investigation was made in accordance with generally accepted engineering procedures and included such field and laboratory tests considered necessary for the project. In the opinion of the undersigned, the accompanying report has been substantiated by mathematical data in conformity with generally accepted engineering principles and presents fairly the design information requested by your organization. No other warranty is either expressed or given.

Respectfully submitted,

SHINSATO ENGINEERING, INC.

Lawrence S. Shinsato, P.E.
President

LSS:RCD:rd



This work was prepared by me
or under my supervision.

TABLE OF CONTENTS

INTRODUCTION

This investigation was made for the purpose of obtaining information on the subsurface conditions from which to base recommendations for foundation design for the proposed Twigg-Smith residence to be located at 3868 Round Top Drive in Honolulu, Hawaii. The location of the site, relative to the existing streets and landmarks, is shown on the Vicinity Map, Plate 1.

SCOPE OF WORK

The services included drilling 4 test borings to depths of 15.0 to 25.0 feet below existing grade, obtaining samples of the underlying soils, performing laboratory tests to determine pertinent engineering properties of the representative soil samples, and performing an engineering analysis to determine foundation design parameters. In general, the following information is provided for use by the Architect and/or Engineer:

1. General subsurface conditions, as disclosed by the borings.
2. Physical characteristics of the soils encountered.
3. Recommendations for foundation design, including bearing values, embedment depth and estimated settlement.
4. Recommendations for placement of fill and backfill.
5. Special design considerations.

PLANNED DEVELOPMENT

From the information provided, the project will consist of constructing a new residence on the property. Sewage disposal is to be by septic tank system with leach fields.

SITE CONDITIONS

Surface

The property, designated by Tax Map Key Number 2-5-18: por 19, is located on the north side of Round Top Drive at the corner of Round Top Drive and Pu'u Kakea Place. The lot is bordered by Round Top Drive to the south and east sides, Pu'u Kakea Place to the west and southwest, an existing residence to the northwest and a forest reserve on the north.

At the time of the investigation, the lot was vacant and covered by moderately dense to sparse growth of grass and bare soil. At the corner of Pu'u Kakea Place and RoundTop Drive on the southern boundary, the ground surface slopes up from the street elevation to a relatively level pad on the middle of the lot, then slopes steeply down to the northern boundary. Along the northwest boundary, the ground slopes up to the adjoining property.

From the topographic map provided, surface elevations range from about +1344' at the southerly side to +1364' at the east side of the lot, and +1316' on the northern corner of the property.

Subsurface

The subsurface conditions at the site were explored by drilling 4 test borings to depths of 15.0 to 25.0 feet. The locations of the borings are shown on the Plot Plan, Plate 2. Detailed logs of the borings are presented in the Appendix to this report.

In general, the borings encountered moderately stiff to very stiff, brown elastic SILT to a depth of 3 feet followed by medium dense to very loose GRAVEL (CINDERS) to the final depth of the borings. At Boring 2, very dense COBBLES were encountered from 13.5 to 15 feet.

At Boring 4, moderately stiff to stiff, brown elastic SILT was found to a depth of 3.0 feet followed by loose silty SAND (CINDERS) to a depth of 6.0 feet below existing grade. Below the silty SAND, very loose GRAVEL (CINDERS) was found to a depth of 15.0 feet. Below the GRAVEL at 15.0 feet, the boring was probed using a 2-inch diameter probe rod advanced with a 140-pound driving weight, dropping from a height of 30 inches. At 15.0 feet below existing grade, the material encountered graded to medium dense to the final depth of the boring at 25.0 feet.

No groundwater was encountered in any of the borings at the time of the field investigation.

From the USDA Soil Conservation Service "Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai and Lanai, State of Hawaii," the site is located in an area designated as Tantalus silt loam, 40 to 70 percent slopes (TAF). The Tantalus series consist of well-drained soils on uplands. These soils developed in volcanic ash and material weathered from cinders. Permeability is moderately rapid. Runoff is medium to rapid and the erosion hazard is severe (USDA, 1972, pp. 121, Plate 62).

Geology

The site is located on the southeastern flank of the elongated Koolau Mountain range. The mountain range is believed to have formed during the late Tertiary/early Pleistocene time (between 1 and 12 million years ago). Lavas flowed from rift zones roughly paralleling the existing mountain crest trends to form the main shield of the volcano.

After cessation of the main volcanic activity, erosion reduced the height of the volcanic dome by as much as 1,000 feet. Stream activity cut deep valleys into the mountain range. During high stands

of sea levels, the valleys were infilled with sediment (alluviated) grading to the high sea level stands (Stearns, 1967).

Late-stage volcanic eruptions occurred on the southeasterly end of the Koolau mountains. These late-stage eruptions, known as the Honolulu Volcanic Series, form familiar landmarks on Oahu such as Diamond Head, Punchbowl, Tantalus, Round Top and Salt Lake craters (Stearns and Vaksvik, 1935).

CONCLUSIONS AND RECOMMENDATIONS

General

Based on the findings and observations of this investigation, it is concluded that the proposed residential structure may be supported on spread and continuous footings that bear on firm on-site soils, the underlying CINDERS or properly compacted fill.

Special Considerations

Special considerations will be required in the design and construction of the project due to existing site conditions. These include the following:

a) The bottom of all footing excavations that bear on existing on-site soils shall be compacted prior to constructing the footing.

b) Construction cuts into the underlying loose GRAVEL and SAND are susceptible to caving. Shoring will likely be required to support deep excavations. Proper safety measures should be taken during construction to protect excavations from cave-ins.

c) Compaction of fills and backfills shall be performed with static rollers or small vibratory compactors. The use of large vibratory equipment may cause damage to adjacent structures.

Foundations

An allowable bearing value of 2,000 pounds per square foot may be used for footings bearing on firm on-site soils, the underlying CINDERS or properly compacted fill. The minimum footing embedment depth shall be 12 inches below the lowest adjacent finished grade. The bearing value may be increased by 250 psf for each additional foot of embedment to a maximum of 3,000 psf.

For footings located adjacent to utility trenches, the bottom of the footing shall be deepened below a 1 horizontal to 1 vertical plane projected upwards from the edge of the utility trench.

For footings located on or adjacent to slopes, the footing shall be deepened such that there is a minimum horizontal distance of 5 feet from the edge of the footing to the slope face.

Where footings are to be located adjacent to retaining walls or other structural elements which are not designed for surcharge loading, the new footing shall be deepened below a 45-degree plane projected upwards from the adjacent structure.

The bearing value is for dead plus live loads and may be increased by one-third (1/3) for momentary loads due to wind or seismic forces. If any footing is eccentrically loaded, the maximum edge pressure shall not exceed the bearing pressure for permanent or for momentary loads.

The bottom of all footing excavations shall be compacted prior to constructing the footing. Any loose soils which cannot be compacted shall be removed to firm material and the resulting depression shall be backfilled with properly compacted structural fill. Disturbed soil and soil which falls into the footing excavation shall be removed prior to pouring of concrete.

In accordance with the 1997 Uniform Building Code, Section 1636, the soil profile type may be assumed as S_E (soft soil).

Settlement

Under the fully applied recommended bearing pressure, it is estimated that the total settlement of footings up to 5 feet square or 3 feet continuous that bear on properly compacted FILL or the underlying CINDERS will be less than 3/4 inch.

Differential settlement between footings will vary according to the size and bearing pressure of the footing.

Lateral Resistance

For resistance of lateral loads, such as wind or seismic forces, an allowable passive resistance equivalent to that exerted by a fluid weighing 300 pounds per cubic foot may be used for footings, or other structural elements, provided the vertical surface is in direct contact with undisturbed soil or properly compacted fill.

Frictional resistance between footings and slabs, and the underlying soils may be assumed as 0.4 times the dead load.

Lateral resistance and friction may be combined.

Retaining Walls

Foundations for retaining walls shall be designed as per the foundation section of this report.

For design of free-standing retaining walls that have properly draining backfill using imported select granular material or on-site SAND and GRAVEL, the following active earth pressures may be used:

Backfill Slope	Horizontal Component	Vertical Component
Level backfill	30 psf/lin. ft.	0
3H:1V backfill	35 psf/lin. ft.	10 psf/lin. ft.
2H:1V backfill	45 psf/lin. ft.	20 psf/lin. ft.

Free-standing walls are defined as walls that are allowed to rotate between 0.005 and 0.01 times the wall height. The rotation of the wall develops "active earth pressures." If the wall is not allowed to move as in the case of basement walls or walls that are restrained at the top, the soil pressure that will develop is known as an "at-rest" pressure. For restrained walls, the above active earth pressures shall be increased by 50 percent.

Drainage for retaining wall backfill shall be accomplished by providing 4-inch diameter weepholes spaced 8-feet on-center (horizontally as well as vertically) or by using a minimum 4-inch diameter perforated PVC footing drain pipe. A 2-foot wide layer of crushed gravel, which is wrapped with geotextile filter fabric, shall be placed above the pipe; the crushed gravel shall be continuous from weephole to weephole, or in the case of a footing drain pipe, laid throughout the full length of the pipe. Geotextile fabric shall be AMOCO 4545 or similar.

Backfill for retaining walls shall be properly compacted in accordance with the Site Preparation and Grading section to this report.

The above active pressures do not include surcharge loads such as footings located within a 45-degree plane projected upwards from the heel of the footing, and/or from hydrostatic pressures. If such conditions occur, the active pressure shall be increased accordingly.

Slab-on-Grade

No expansive type soils were observed on the site or encountered in the explorations. Conventional slab-on-grade construction may be used. However, during construction should expansive CLAY soils be found under slab areas, the expansive CLAY shall be removed and if necessary to achieve finished subgrade elevation, shall be replaced with properly compacted structural fill.

Moisture barriers shall be provided under floor slabs with moisture sensitive floor covering.

Floor slabs shall be constructed with a minimum of 4-inches of granular cushion material such as #3-fine gravel (ASTM Designation No. 67).

Preparation of the subgrade shall be in accordance with the Site Preparation and Grading section to this report.

Slopes

Cut and fill slopes shall not exceed 2 horizontal to 1 vertical.

Exposed slopes shall be covered as soon as practical after construction to minimize erosion.

Fill slopes shall be constructed by either overfilling and cutting back to compacted soil, or the slope shall be track-rolled.

Site Preparation and Grading

It is recommended that the site be prepared in the following manner:

1. Clearing and Grubbing:

   In all areas to receive fill and in structural areas, all vegetation, weeds, brush, roots, stumps, rubbish, debris, soft soil and other deleterious material shall be removed and disposed of off-site.

2. Preparation of Ground to Receive Fill:

   The exposed surface shall then be scarified to a depth of 6 inches, moisture conditioned to near optimum moisture (ASTM D1557-91) and then compacted to the degree of compaction specified below. If soft or loose spots are encountered, the loose/soft areas shall be removed to firm material and the resulting depression shall be filled with properly compacted fill.

3. Types of Fill and Backfill Material:

   Structural fill and backfill shall be described as material placed beneath buildings and extending a horizontal distance of 3 feet beyond the edge of the building line. Non-structural fill shall be described as material placed beyond 3 feet from the building line.

4. Material Quality:

Fill and backfill material shall consist of soil which is free of organics and debris. The maximum size particle for fill and backfill material shall be as follows:

Structural Fill	
Top 2 feet below finished subgrade (FSG)	3"
Below 2 feet from FSG	6"
Non-structural fill and Pavement areas	
Top 2 feet from FSG	3"
2 to 6 feet from FSG	6"
Below 6 feet from FSG	*

(FSG = Finished Subgrade Elevation)

*Generally minus 12-inch size material is preferred. However, larger rock or boulders (up to 24 inches in diameter) may be used in deep fills provided they are well embedded and geotextile filter fabric is placed over the "boulder" fill. If utility lines are to be installed within fill areas, the maximum particle size shall be reduced to minimize obstruction of trenching work.

Structural fill shall have a Unified Soil Classification of either GW, GM, GC, SW, SM or SC. The plasticity index of the fine portion as determined by the ASTM D4318-84 test shall be less than 15.

The on-site CINDERS may be used as structural fill and backfill (in the upper 6 inches from finished subgrade, and within a 45-degree plane projected upwards from the bottom of the retaining wall footing).

5. Placement of Fill and Backfill:

Each layer of fill and backfill material shall be placed in lifts not exceeding the following (loose thickness):

Structural Fill (including roadways)

Top 2 feet below finished subgrade (FSG)	8"
Below 6 feet from FSG	12"

Non-structural fill

Top 6 feet from FSG	12"
Below 6 feet from FSG	*

*The loose thickness of this layer shall not exceed 1.5 times the largest size particle; this is predicated upon proper compaction of each lift.

Prior to placing of fill and backfill material, the material shall be aerated or moistened to near optimum moisture content (ASTM D1557-91 test procedure).

Where fill is placed on existing ground than is steeper than 5 horizontal to 1 vertical, the existing ground surface shall be benched into firm soil as the fill is placed.

6. Degree of Compaction:

Each layer of fill and backfill shall be thoroughly compacted from edge to edge using conventional compaction equipment designed for the purpose. The minimum degree of compaction for each layer (as determined by the ASTM D1557-91 test procedure) shall be as follows:

Structural Fill (under and 3 feet beyond the edge of buildings):	95%
Non-structural fill	*90%

*Where compaction tests are not practical due to the size of the material, each layer shall be compacted by trackrolling until it does not weave or creep under the weight of the trackrolling equipment (D-8 dozer or larger).

Compaction of fills and backfills shall be performed with static rollers or small vibratory compactors. The use of large vibratory equipment may cause damage to adjacent structures.

It is particularly important to see that all fill and backfill soils are properly compacted in order for the design parameters to remain applicable.

7. Preparation of Footing Excavations:

The bottom of all footing excavations shall be compacted with mechanical compaction equipment to an unyielding surface (i.e. surface does not pump under compactive effort). Any soft/loose soils encountered at the bottom of the footing excavation which cannot be compacted shall be removed to firm material. The resulting depression shall then be backfilled with properly compacted structural fill. Soil which is subsequently disturbed and soil which falls into the footing excavation shall be removed prior to pouring of concrete.

8. Site Drainage:

During construction, drainage shall be provided to minimize ponding of water adjacent to or on foundation and pavement areas. Ponded areas shall be drained immediately. Any

subgrade soil that has become soft due to ponding shall be removed to firm material and replaced with compacted structural fill.

INSPECTION

During the progress of construction, so as to evaluate compliance with the design concepts, specifications and recommendations contained in this report, qualified engineering personnel should be present to observe the following operations:

1. Site preparation.
2. Placement of fill and backfill.
3. Footing excavations.

REMARKS

The conclusions and recommendations contained herein are based on the findings and observations made at the boring locations. If conditions are encountered during construction which appear to differ from those disclosed by the explorations, this office shall be notified so as to consider the need for modifications.

This report has been prepared for the exclusive use of Mr. and Mrs. Michael Twigg-Smith and their respective design consultants. It shall not be used by or transferred to any other party or to another project without the consent and/or thorough review by this facility. Should the project be delayed beyond the period of one year from the date of this report, the report shall be reviewed relative to possible changed conditions.

Samples obtained in this investigation will deteriorate with time and will be unsuitable for further

laboratory tests within one (1) month from the date of this report. Unless otherwise advised, the samples will be discarded at that time.

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The following are included and complete this report:

Foundation Design Details---------- Plate A

Vicinity Map ---------- Plate 1

Plot Plan ---------- Plate 2

Appendix

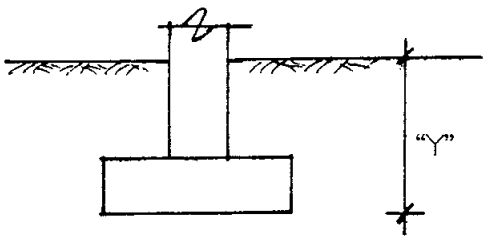
Field Investigation

Laboratory Testing

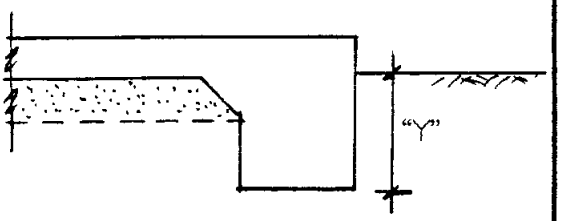
Logs of Borings

Results of Laboratory Tests

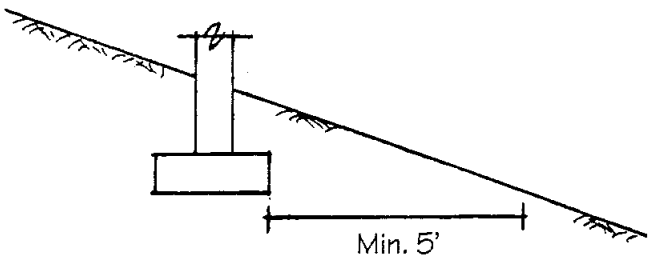
"Y" = min. of 12" for footings bearing on firm on-site soils and properly compacted fill; allowable soil bearing pressure = 2,000 psf. Bearing pressure may be increased by 250 psf for each additional foot of embedment to a maximum of 3,000 psf. Reinforcing details to be provided by others.



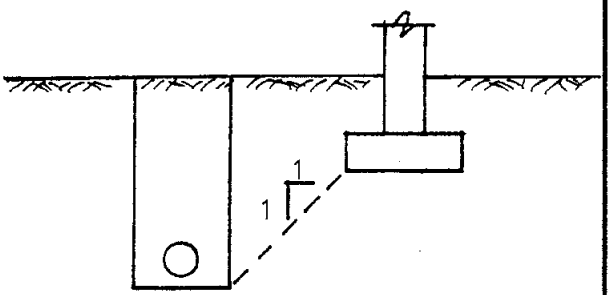
COLUMN FOOTING



THICKENED EDGE FOOTING



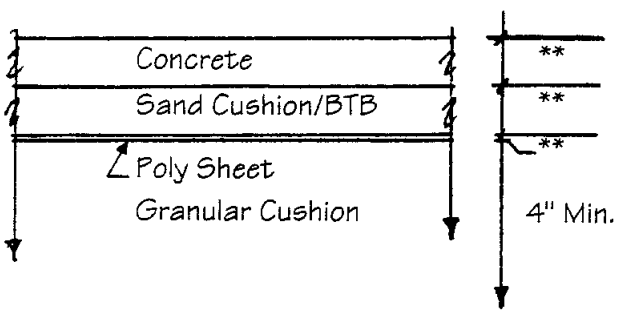
FOOTING ON SLOPE



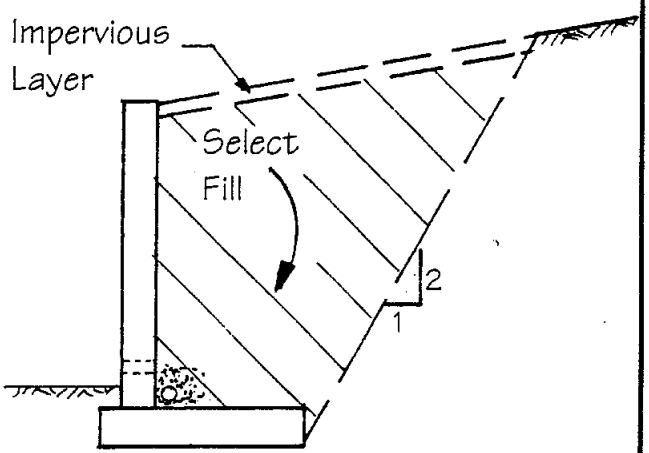
FOOTING ADJACENT TO UTILITY TRENCH

FOOTING EMBEDMENT DEPTH DETAILS

**Thickness/Details By Others



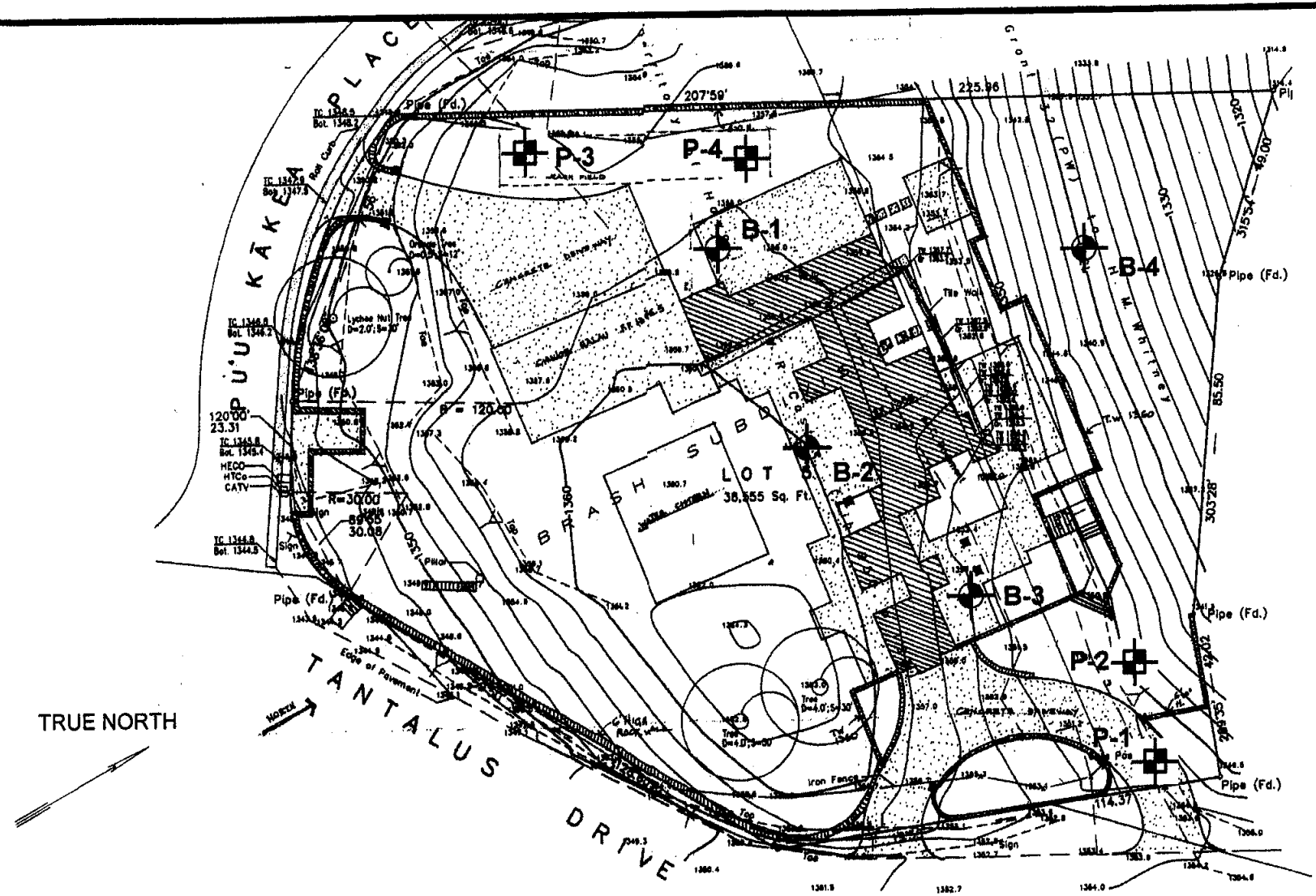
SLAB-ON-GRADE



RETAINING WALL BACKFILL

(Provide Backfill Drainage Using Weepholes or Footing Drain; Cap Surface with Impervious Layer)

Project: TWIGG-SMITH RESIDENCE 3868 ROUND TOP DRIVE Project No.: 01-0134	**SHINSATO ENGINEERING, INC.** 98-747 KUAHAO PL., PEARL CITY, HI 96782 *Consulting Geotechnical Engineer*	PLATE **A**



PLOT PLAN
SCALE: 1" = 40'

LEGEND:

- BORING LOCATION
- PERCOLATION TEST LOCATION

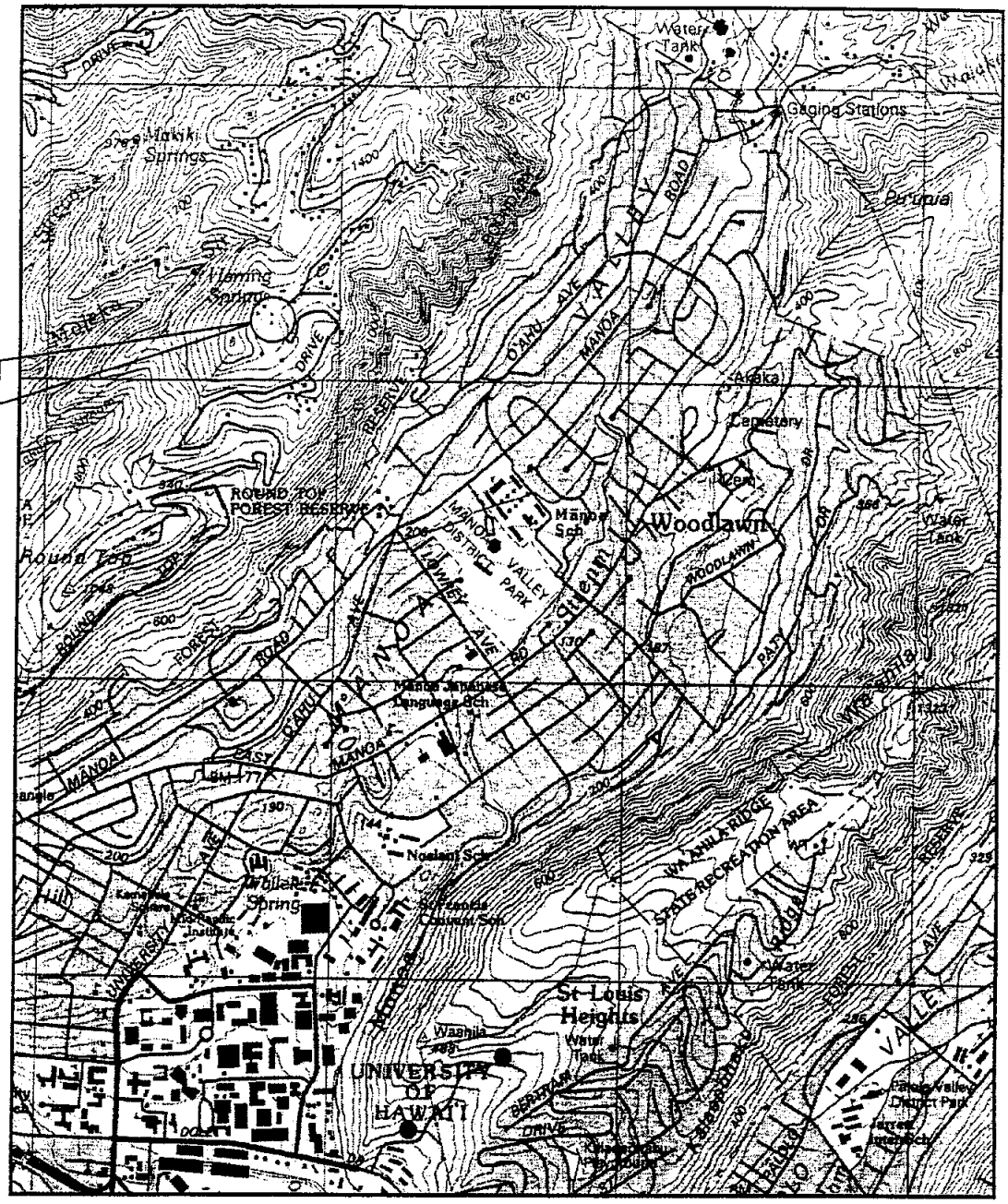
Project:	TWIGG-SMITH RESIDENCE ROUNDTOP DRIVE
Project No.:	01-0134

SHINSATO ENGINEERING, INC.
CONSULTING GEOTECHNICAL ENGINEERS
98-747 KUAHAO PL. PEARL CITY, HI 96782

PLATE 2

VICINITY MAP

SITE LOCATION



TRUE NORTH

REFERENCE:
USGS TOPOGRAPHIC MAP
HONOLULU QUADRANGLE
DATED 1998

TWIGG-SMITH RESIDENCE
ROUNDTOP DRIVE

SHINSATO ENGINEERING, INC.
CONSULTING GEOTECHNICAL ENGINEERS

98-747 KUAHAO PL. PEARL CITY, HI 96782

PROJECT NO. 01-0134

DATE: 10/01

SCALE: 1"=2000'

PLATE 1

APPENDIX

FIELD INVESTIGATION AND LABORATORY TESTING

FIELD INVESTIGATION

General

The field investigation consisted of performing explorations at the locations shown on the Plot Plan.

The borings were drilled using gas-powered drilling equipment. The hole was advanced using 4-inch diameter continuous helical flight augers with the lead auger having a head equipped with changeable cutting teeth. Soil cuttings are brought to the surface by the continuous flights. After the bore hole is advanced to the required depth and cleaned of cuttings by additional rotation of the augers, the augers are retracted for soil sampling or in-situ testing.

Soil Sampling

Relatively undisturbed samples of the underlying soils are obtained from borings by driving a sampling tube into the subsurface material using a 140-pound safety hammer falling from a height of 30 inches. Ring samples are obtained using a 3-inch outside diameter, 2.5-inch inside diameter steel sampling tube with an interior lining of one-inch long, thin brass rings. The tube is driven approximately 18 inches into the soil and a section of the central portion is placed in a close fitting waterproof container in order to retain field conditions until completion of the laboratory tests. The number of blows required to drive the sampler into the ground is recorded at 6-inch intervals. The blow count for the last 12-inches is shown on the boring logs unless changes in the soil material are encountered. If changes are found, the blow counts for other intervals are shown on the logs.

Probing is done to determine soil consistency at deeper depths. The probe consists of a 2-inch diameter steel tip that is attached to AW drilling rods. The probe is driven into the underlying material with a 140-pound hammer falling from a height of 30-inches. Blow counts are recorded at 12-inch intervals and are shown on the boring logs.

The soil samples are visually classified in the field using the Unified Soil Classification System. Samples are packed in moisture proof containers and transported to the laboratory for testing.

LABORATORY TESTING

General

Laboratory tests are performed on various soil samples to determine their engineering properties. Descriptions of the various tests are listed below.

Unit Weight and Moisture Content

The in-place moisture content and unit weight of the samples are used to correlate similar soils at various depths. The sample is weighed, the volume determined, and a portion of the sample is placed in the oven. After oven-drying, the sample is again weighed to determine the moisture loss. The data is used to determine the wet-density, dry-density and in-place moisture content.

Classification Tests

The terms and symbols used to describe the soil materials are based on the Unified Soil Classification System which provides a basis for classifying soils using either visual methods or laboratory test results. Laboratory tests include sieve and hydrometer analysis for particle size distribution, and Atterberg Limits test for liquid limit, and plasticity index determination.

Grain-size distribution of the soil is determined by passing the soil through a series of sieves. If 50 percent or more of the soil by dry weight passes the #200 sieve, the soil is classified as fine-grained. If more than 50 percent of the soil by dry weight is retained on the #200 sieve, the soil is classified as coarse grained.

Coarse grained soils are described as follows:

Boulder:	Material retained on a 12-inch square sieve
Cobble:	Material passing a 12-inch sieve but retained on a 3-inch sieve
Gravel:	Material passing a 3-inch sieve but retained on a #4 sieve
Sand:	Material passing a #4 sieve but retained on a #200 sieve

Fine-grained materials are silts and clays. The liquid limit and plastic limit results from an Atterberg Limits test are used to determine if the soil is a silt or clay.

Penetrometer Test

Penetrometer tests are performed on clayey soils to determine the consistency of the material and an approximate value of the unconfined compressive strength.

Torvane

Torvane tests are used to determine the approximate undrained shear strength of clayey soils. The torvane apparatus consists of a torque device with a small diameter plate that has vanes situated perpendicular to the plate. The vanes are pushed into the soil and torque is applied until failure occurs. The torque required to cause failure is converted to approximate undrained strength of the soil.

Consolidation Test

Consolidation tests are performed to obtain data from which time rates of consolidation and amounts of settlement may be estimated. The test is performed by placing a specimen in a consolidation apparatus. Loads are applied in increments to the circular face of a one (1) inch high sample. Deformation or changes in thickness of the specimen are recorded at selected time intervals. Water is introduced to or allowed to drain from the sample through porous disks placed against the top and bottom faces of the specimen. The data is then used to plot a stress-volume strain curve which is used in estimating settlement.

Direct Shear

Direct shear tests are performed to determine the strength characteristics of the representative soil samples. The test consists of placing the sample into a shear box, applying a normal load and then shearing the sample at a constant rate of strain. The shearing resistance is recorded at various rates of strain. By varying the normal load, the angle of internal friction and cohesion can be determined.

LOG OF BORING NO. 1

ELEVATION: +1357' (estimate)

EQUIPMENT USED: Badger Drilling Rig

DEPTH OF BORING (FT.): 17

DATE DRILLED: October 22, 2001

DEPTH TO GROUNDWATER: None

DEPTH (FT.)	GRAPHIC SYMBOL	UNIFIED SOIL CLASSIFICATION	DESCRIPTION	SAMPLE	BLOWS/FOOT	COLOR	MOISTURE	CONSISTENCY	DRY DENSITY (PCF)	MOISTURE CONTENT (% OF DRY WT.)	PENETROMETER (TSF)	TORVANE STRENGTH (TSF)
0		MH	elastic SILT;			brown	moist	mod. stiff				
2					7				54.0	72.0	1.80	1.00
		GW-GM	well graded GRAVEL (CINDERS) with sand and silt; highly to completely weathered					med. dense				
4					21				66.2	56.0	4.00	1.10
6								loose				
					11				67.6	43.2		
8												
10					9				67.7	53.0		
12								very loose				
14						brown to light brown						
					5				60.7	37.5		
16					2							
					3					56.1		
18			END OF BORING									
20												
22												
24												
26												
28												

PROJECT NAME: TWIGG-SMITH RESIDENCE
ROUNDTOP DRIVE

PROJECT NO.: 01-0134

SHINSATO ENGINEERING, INC.
Consulting Geotechnical Engineers
98-747 Kuahao Pl.
Pearl City, HI 96782

PLATE 3

LOG OF BORING NO. 2

EQUIPMENT USED: Badger Drilling Rig

DATE DRILLED: October 22, 2001

ELEVATION: +1359' (estimate)

DEPTH OF BORING (FT.): 15

DEPTH TO GROUNDWATER: None

DEPTH (FT.)	GRAPHIC SYMBOL	UNIFIED SOIL CLASSIFICATION	DESCRIPTION	SAMPLE	BLOWS/FOOT	COLOR	MOISTURE	CONSISTENCY	DRY DENSITY (PCF)	MOISTURE CONTENT (% OF DRY WT.)	PENETROMETER (TSF)	TORVANE STRENGTH (TSF)
0		MH	elastic SILT; with gravel and sand (cinders)			brown	moist	very stiff				
2					31				69.9	50.0	4.50	
4		GW-GM	well graded GRAVEL (CINDERS), with sand and silt; highly to completely weathered		24			med. dense	65.9	43.6		
6					16	brown and black		loose	64.8	43.5		
8												
10					8				59.4	48.6		
12												
14		(COB)	COBBLES		100			very dense		37.3		
			END OF BORING									
16												
18												
20												
22												
24												
26												
28												

PROJECT NAME: TWIGG-SMITH RESIDENCE
ROUNDTOP DRIVE

PROJECT NO.: 01-0134

SHINSATO ENGINEERING, INC.
Consulting Geotechnical Engineers
98-747 Kuahao Pl.
Pearl City, HI 96782

PLATE 4

LOG OF BORING NO. 3

ELEVATION: +1353' (estimate)

EQUIPMENT USED: Badger Drilling Rig

DEPTH OF BORING (FT.): 15

DATE DRILLED: October 22, 2001

DEPTH TO GROUNDWATER: None

DEPTH (FT.)	GRAPHIC SYMBOL	UNIFIED SOIL CLASSIFICATION	DESCRIPTION	SAMPLE	BLOWS/FOOT	COLOR	MOISTURE	CONSISTENCY	DRY DENSITY (PCF)	MOISTURE CONTENT (% OF DRY WT.)	PENETROMETER (TSF)	TORVANE STRENGTH (TSF)
0		AC	A.C. 2.5" thick			brown	moist	very stiff				
		MH	elastic SILT; with gravel (cinders) --tree root									
2					25				51.1	68.9		
		GW-GM	well graded GRAVEL (CINDERS), with sand and silt; highly to completely weathered					med. dense				
4					24				63.7	49.0		
6					8			loose	53.4	47.3		
8												
10					12				55.9	44.3		
12												
14					7	light brown to brown		very loose to loose	58.2	56.2		
			END OF BORING									
16												
18												
20												
22												
24												
26												
28												

PROJECT NAME: TWIGG-SMITH RESIDENCE
ROUNDTOP DRIVE

PROJECT NO.: 01-0134

SHINSATO ENGINEERING, INC.
Consulting Geotechnical Engineers
98-747 Kuahao Pl.
Pearl City, HI 96782

PLATE 5

LOG OF BORING NO. 4

ELEVATION: +1338' (estimate)

EQUIPMENT USED: Minuteman Drill Rig

DEPTH OF BORING (FT.): 25

DATE DRILLED: October 23, 2001

DEPTH TO GROUNDWATER: None

DEPTH (FT.)	GRAPHIC SYMBOL	UNIFIED SOIL CLASSIFICATION	DESCRIPTION	SAMPLE	BLOWS/FOOT	COLOR	MOISTURE	CONSISTENCY	DRY DENSITY (PCF)	MOISTURE CONTENT (% OF DRY WT.)	PENETROMETER (TSF)	TORVANE STRENGTH (TSF)
0		MH	elastic SILT (ASH); some sand and gravel (cinders), trace roots			brown	moist	mod. stiff				
2				■	16			stiff	51.0	82.9	2.50	0.80
		SM	silty SAND; with gravel (cinders)					loose				
4				■	9				59.4	60.9		
6		GW-GM	well graded GRAVEL (CINDERS), with sand and silt; highly to completely weathered			brown and dark gray		very loose				
				■	6					47.9		
8												
10				■	4					47.4		
12												
14												
				■	6					47.4		
16			PROBE from 15 to 25 feet to determine soil consistency; probed with a 2-inch diameter steel probe tip driven with a 140# hammer falling from a height of 30-inches		11			med. dense				
					13							
18					15							
					18							
20					16							
					20							
22					24							
					27							
24					26							
					24							
26			END OF BORING									
28												

PROJECT NAME: TWIGG-SMITH RESIDENCE
ROUNDTOP DRIVE

PROJECT NO.: 01-0134

SHINSATO ENGINEERING, INC.
Consulting Geotechnical Engineers
98-747 Kuahao Pl.
Pearl City, HI 96782

PLATE
6

KEY TO SYMBOLS

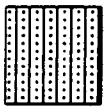
Strata symbols

elastic SILT

well graded GRAVEL
with silt

COBBLES

Paving



silty SAND

Soil Samplers

Portion of sampler drive; no sample taken

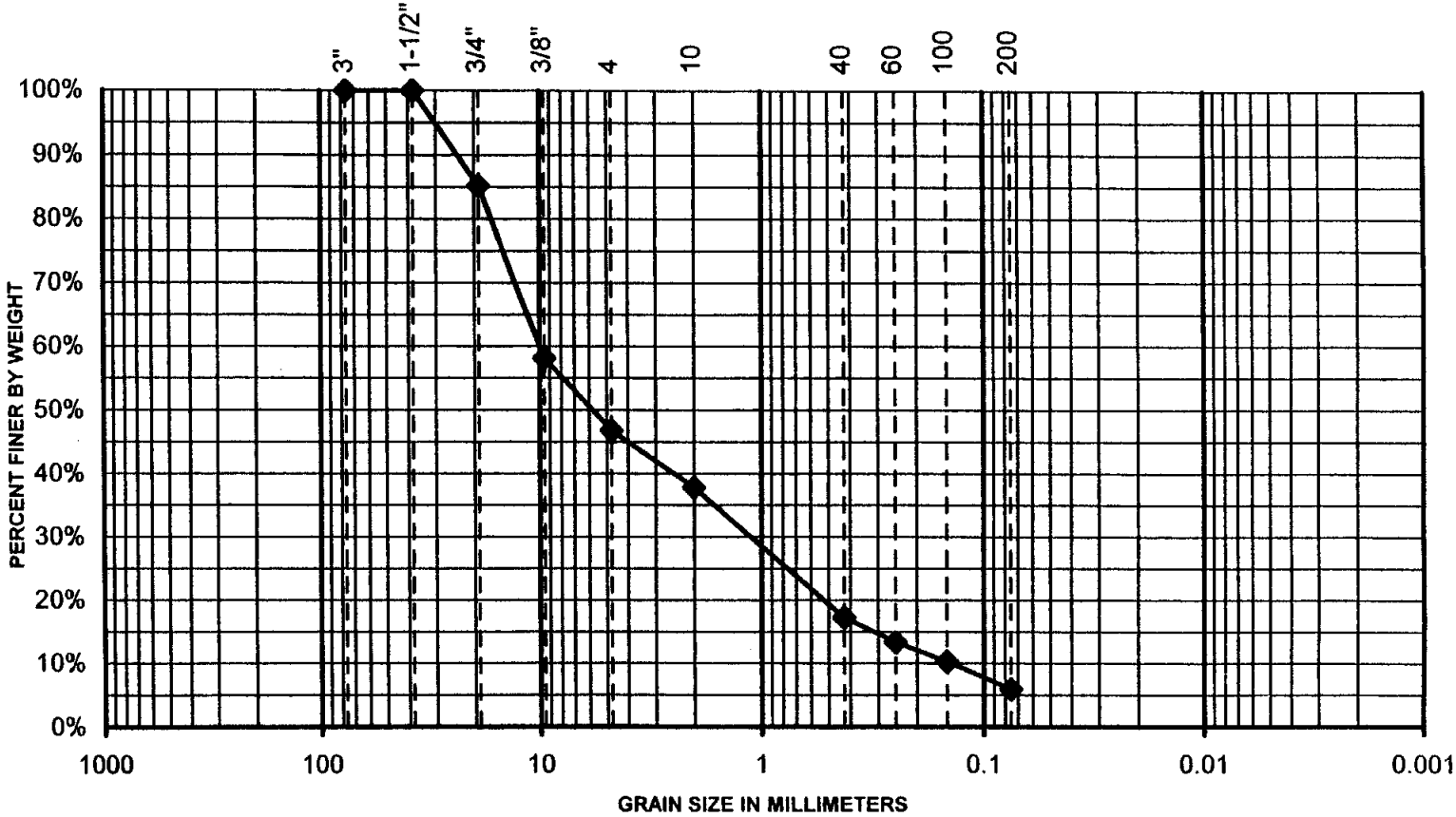
3-inch O.D. split barrel sampler

2-inch Standard Penetration Test Sampler

PROBE: 2-inch diameter steel rod driven with a 140# hammer falling from a height of 30 inches

GRAIN SIZE DISTRIBUTION

U.S. STANDARD SIEVE SIZE



PERCENT PASSING	
3"	100.0%
1-1/2"	100.0%
1"	100.0%
¾"	85.2%
3/8"	58.2%
#4	46.8%
#10	37.9%
#40	17.3%
#60	13.4%
#100	10.3%
#200	5.9%

COBBLE	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	CO	MEDIUM	FINE	

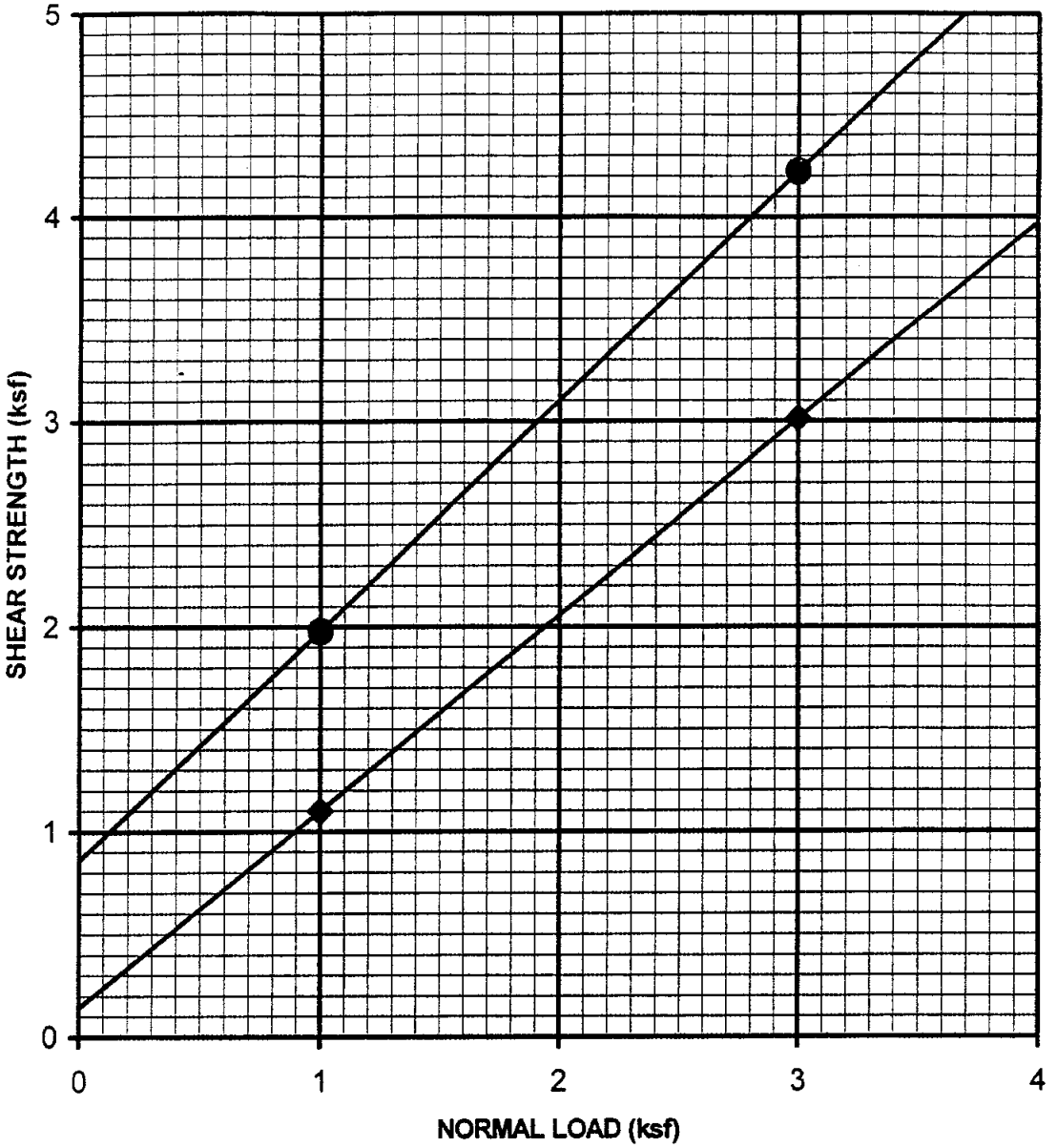
LOCATION	DEPTH	GROUP SYMBOL	CLASSIFICATION	MOISTURE CONTENT	LL	PL	PI
BORING 4/S3	6.5'	GW-GM	well graded GRAVEL; with silt and sand	46.7%			

Project: TWIGG-SMITH RESIDENCE
ROUNDTOP DRIVE
Project No.: 01-0134

SHINSATO ENGINEERING, INC.
CONSULTING GEOTECHNICAL ENGINEERS
98-747 KUAHAO PL. PEARL CITY, HI 96782

PLATE 7

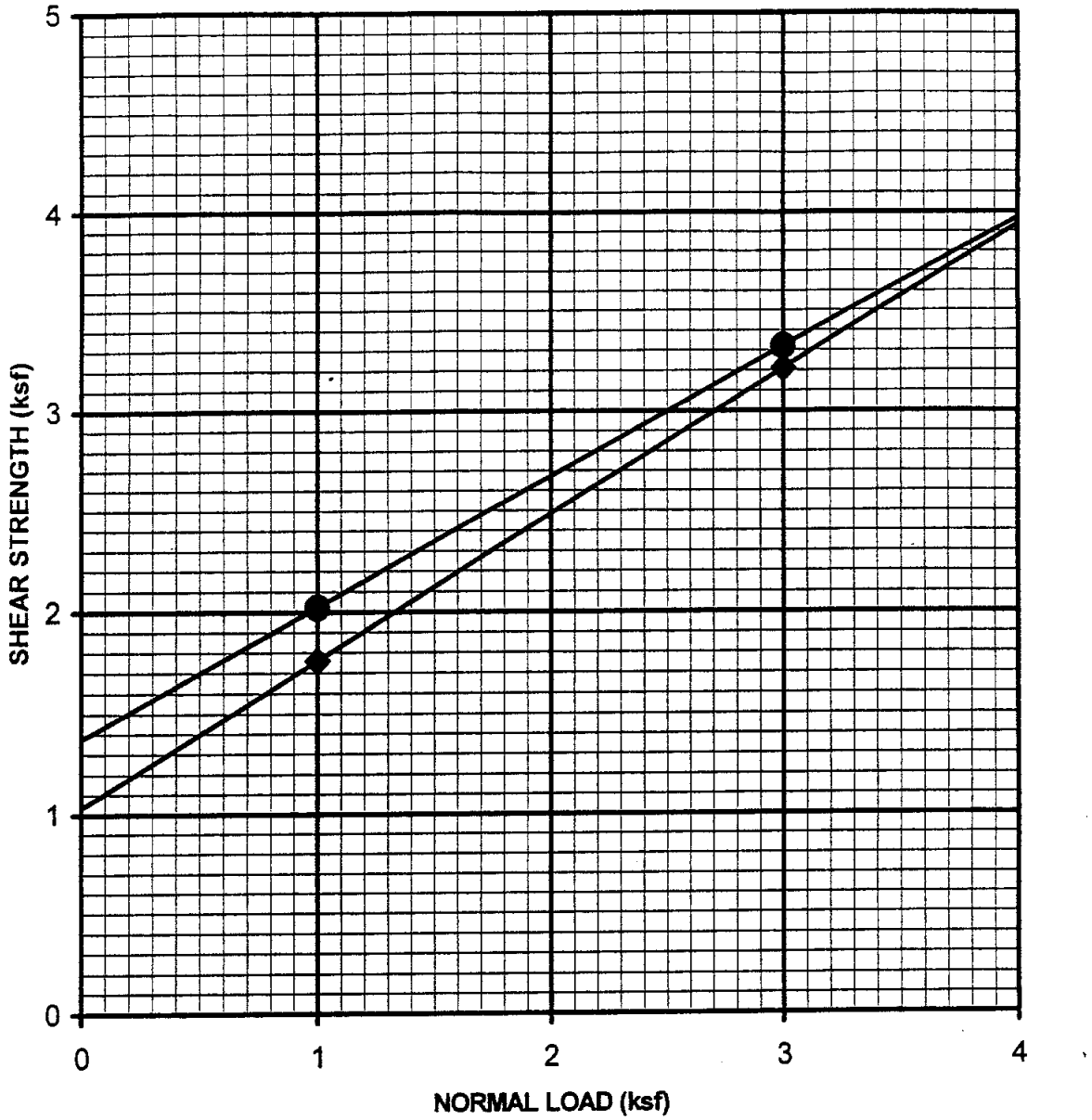
DIRECT SHEAR TEST



	LOCATION	DEPTH (ft.)	COHESION (psf)	ANGLE OF INTERNAL FRICTION	TEST CONDITIONS
●	Boring 1, Sample 3	6.5	858	48	Field density, peak strength
◆	Boring 1, Sample 3	6.5	143	44	Field density, residual strength

Project: TWIGG-SMITH RESIDENCE ROUNDTOP DRIVE Project No.: 01-0134	SHINSATO ENGINEERING, INC. CONSULTING GEOTECHNICAL ENGINEERS 98-747 KUAHAO PL. PEARL CITY, HI 96782	PLATE 8

DIRECT SHEAR TEST



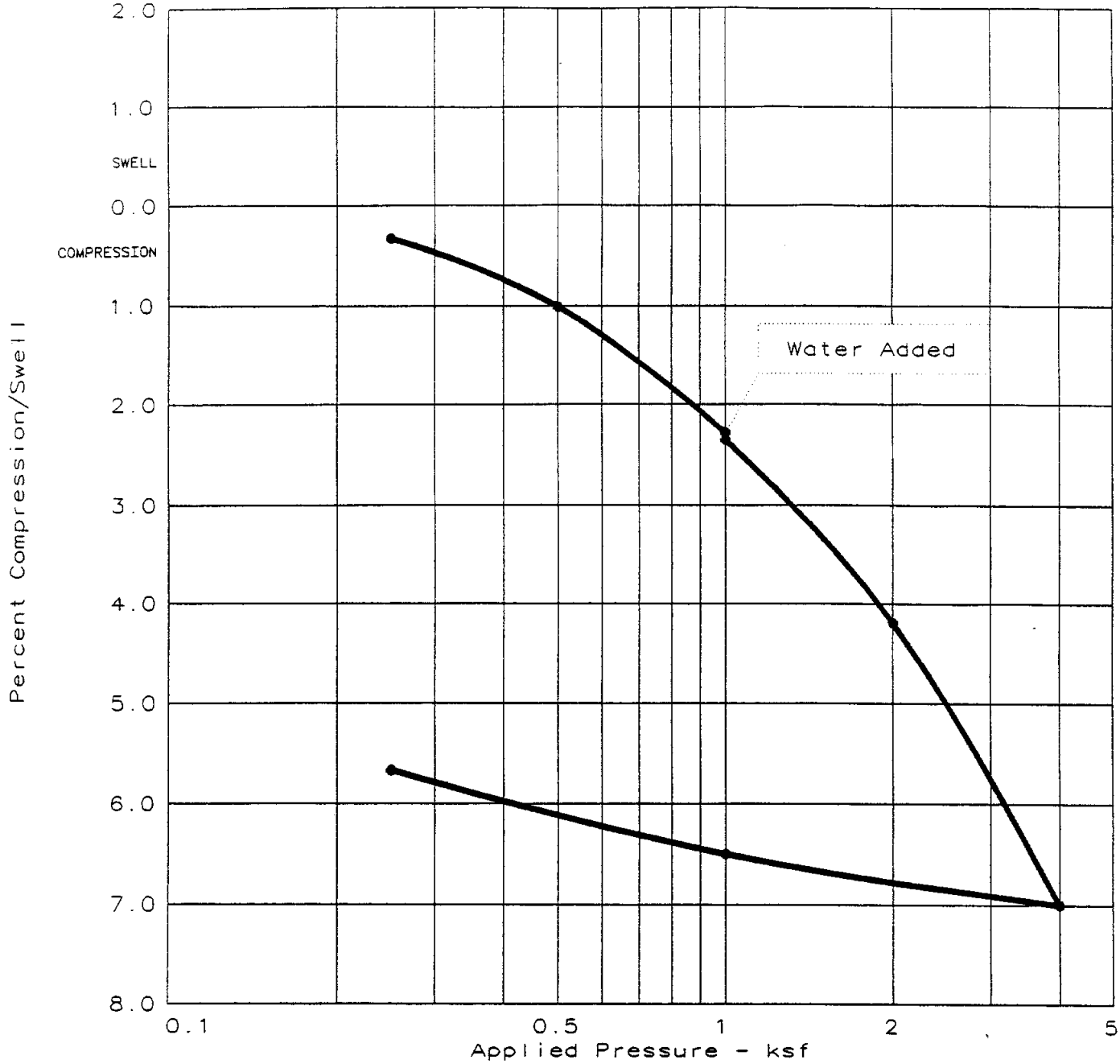
	LOCATION	DEPTH (ft.)	COHESION (psf)	ANGLE OF INTERNAL FRICTION	TEST CONDITIONS
●	Boring 4, Sample 2	4.0	1375	33	Field density, peak strength
◆	Boring 4, Sample 2	4.0	1034	36	Field density, residual strength

Project: TWIGG-SMITH RESIDENCE
ROUNDTOP DRIVE
Project No.: 01-0134

SHINSATO ENGINEERING, INC.
CONSULTING GEOTECHNICAL ENGINEERS
98-747 KUAHAO PL. PEARL CITY, HI 96782

PLATE 9

CONSOLIDATION TEST REPORT



Clpse. %	Nat. Sat.	Nat. Moist.	Dry Dens. (pcf)	LL	PI	Sp.Gr.	Initial void ratio
0.1	85.8 %	69.1 %	53.4			2.760	2.2253

TEST RESULTS

MATERIAL DESCRIPTION

brown elastic SILT

Class: MH

Project No.: 01-0134
Project: TWIGG-SMITH RESIDENCE
Location: Boring 1, Sample 1 at 2.0'

Date: 11/08/01

Remarks:

CONSOLIDATION TEST REPORT

SHINSATO ENGINEERING, INC.

Consulting Geotechnical Engineers

PLATE NO. 10

APPENDIX B

"No Effect" Letter from DLNR
State Historic Preservation Division

January 3, 2002

STATE OF HAWAII

DEPARTMENT OF LAND AND NATURAL RESOURCES

HISTORIC PRESERVATION DIVISION
Kakuhihewa Building, Room 555
601 Kamokila Boulevard
Kapolei, Hawaii 96707

HAWAI`I HISTORIC PRESERVATION DIVISION REVIEW

Log #: 28913
Doc #: 0201EJ03

Applicant/Agency: Dina Tamura Wong, AICP
Plan Pacific
Address: 345 queen Street, Suite 802
Honolulu, Hawaii 96813

SUBJECT: Pre-Assessment Consultation Proposed Puu Kakea Single- Family Residence, Tantalus, Oahu

Ahupua`a: Honolulu (Tantalus)
District, Island: Kona, O`ahu
TMK: (1) 2-5-018:033

1. We believe there are no historic properties present, because:

____ a) intensive cultivation has altered the land
____ b) residential development/urbanization has altered the land
____ c) previous grubbing/grading has altered the land
____ d) an acceptable archaeological assessment or inventory survey found no historic properties
__✔__ e) other: This parcel is part of the five-lot Brash Subdivision that was approved by the Board of Land and Natural Resources in 1989. State Parks commented that historic sites are not likely to be present at these parcels.

2. This project has already gone through the historic preservation review process, and mitigation has been completed ___.

✔ Thus, we believe that "no historic properties will be affected" by this undertaking

Staff: Elaine Jordan Date: 01/03/02

Title: Assistant Archaeologist - O`ahu
Phone: (808) 692-8027

JAN - 7 2002

APPENDIX C

Letter from Ms. Cheryl Soon
Director, Department of Transportation Services
City and County of Honolulu

January 25, 2002

9.0

FILE COPY

DEPARTMENT OF TRANSPORTATION SERVICES
CITY AND COUNTY OF HONOLULU
PACIFIC PARK PLAZA • 711 KAPIOLANI BOULEVARD, SUITE 1200 • HONOLULU, HAWAII 96813
TELEPHONE: (808) 523-4525 • FAX: (808) 523-4730 • INTERNET: www.co.honolulu.hi.us

JEREMY HARRIS
MAYOR

CHERYL D. SOON
DIRECTOR

GEORGE "KEOKI" MIYAMOTO
DEPUTY DIRECTOR

January 25, 2002

TP12/01-05551R

Post-it® Fax Note 7671	Date 2/27/02	# of pages ▶ 1
To Gail Atwater	From Faith Miyamoto	
Co./Dept. R.M. Towill	Co. DTS	
Phone #	Phone # 527-6976	
Fax # 842-1937	Fax # 527-6987	

Ms. Dina Tamura Wong, AICP
PlanPacific
345 Queen Street, Suite 802
Honolulu, Hawaii 96813

Dear Ms. Wong:

Subject: Proposed Puu Kakea Single-Family Residence

This is in response to your letter of December 21, 2001 requesting our review and comments on the Draft Environmental Assessment and Conservation District Use Application for the proposed Puu Kakea Single-Family Residence.

The Department of Transportation Services has no objection to the proposed single-family dwelling in the Conservation District as the project incorporates a canoe halau and a secondary access via Puu Kakea to mitigate potential congestion on Round Top Drive. However, the driveways should be located to ensure adequate sight distance.

Should you have any questions, please contact Bruce Nagao of the Transportation Planning Division at 527-6899.

Sincerely,

Cheryl D. Soon

CHERYL D. SOON
Director

bcc: Traffic Engineering Division R02-2.006

br (B. Nagao) W BN

JAN 30 2002